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NASA Contractor Report 2960

Pilot Evaluation of Sailplane Handling Qualities

A. G. Bennett, Jr.

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Pilot Evaluation of Sailplane Handling Qualities

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1. INTRODUCTION

The performance of competition sailplanes as measured by maximum lift to drag ratio (L/D_{max}) or average cross-country speed has shown a steady improvement with time as shown in Figure 1 (Reference 1). This performance improvement has been due to the continual evolution of airfoils and of fiber-glass and metal structures to achieve low drag and high aspect ratio wings. The quest for high performance has had a profound effect upon the handling qualities of sailplanes. The increased L/D_{max} has increased the range of flight speeds. To minimize the trim drag, the static stability margin has been decreased which has increased control sensitivity and decreased pitch control force gradients. The very slender wing and fuselage structures have also introduced aeroelastic effects upon the sailplane control response characteristics.

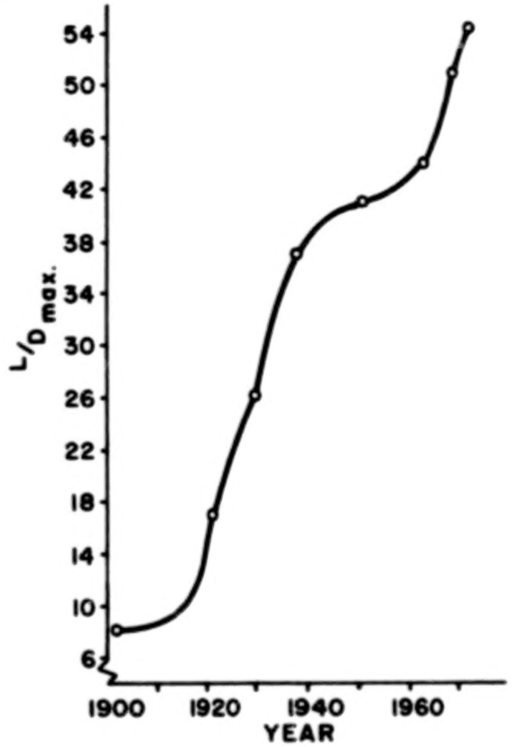

Figure 1. L/D_{max} Versus Time

There has been some concern voiced about the trends in high performance sailplane handling qualities. Poor handling qualities generally result in increased pilot workload which may compromise flight safety. Thus there is a strong interest in determining whether the current trends in sailplane performance improvement can continue while at the same time a high level of flight safety can be maintained.

The primary objective of this study was to make a qualitative evaluation of all aspects of high performance sailplane handling qualities and to define areas which require further study. To accomplish this objective at a modest cost, a round-robin flight evaluation of several sailplanes by several test pilots was conducted. The Cooper-Harper Rating Scale and pilots' comments

were to be used to evaluate the sailplane handling qualities. The specific objectives of this study were:

1. Using the Cooper-Harper Rating Scale and pilot comments investigate the handling qualities of high performance sailplanes.

2. Obtain pilot opinion of handling quality characteristics to assist the formulation of airworthiness standards.

3. Develop a data base of pilot opinion which would be of value in the design of future sailplanes.

4. Delineate areas which warrant more quantitative study.

The development of high performance sailplanes has evolved in discrete stages with several sailplanes vieing for the market at each stage. Thus it was determined that if the sailplanes developed since the early 60's were arranged into groups, then one sailplane from each group should be chosen for the evaluation session. The sailplane grouping logic is given as follows:

Group 1: Borderline between utility and racing class, L/D_{max} mid 30's.

Group 2: First sailplanes to use fiberglass structures. Represents technology in the late 60's. Most have camber changing flaps and/or drag chute.

Group 3: Sailplanes developed in early 70's. Most numerous class in USA today, hence important.

Group 4: Sailplanes developed during mid 70's. Just becoming available in substantial numbers. Most have landing flaps.

Group 5: Very high performance, $L/D_{max} \approx 50$. Effect of large span on handling can be established by this class.

Group 6: High performance two place. Used in transition to high performance single place sailplanes.

Test pilots for the flight session were chosen from NASA, FAA and the soaring community to ensure that a wide range of pilot backgrounds would be brought to bear upon the sailplane handling quality evaluations.

The text which follows describes the evaluation session and presents the analysis of the pilot opinion data. Chapter 2 describes the sailplanes, pilots and the flight session. Chapter 3 presents the analysis of the pilot

ratings and comments. The evaluation questionnaire, pilot ratings, and pilot comments are presented in the Appendices.

The sailplane owners are due a special thanks for lending their sailplanes for the flight test session. They were Mr. John Thompson, McCrory, Arkansas; Mr. Lanier Franz, Roanoke, Virginia; Mr. Dave Lawrence, Starkville, Mississippi; Mr. Marion Griffith, Dallas, Texas; Schweizer Aircraft Corporation, Elmira, New York, and the Air Force Flight Dynamics Laboratory, Dayton, Ohio. Many members of the Soaring Society of America gave this project unstinting support. Mr. Howard Ebersole, Associate Director of the Raspet Flight Research Laboratory, provided excellent organizational support in the sailplane preparation and in the flight session. The departmental staff support for this project was as usual, superb.

2. SAILPLANE FLIGHT TEST SESSION DESCRIPTION

2.1 Introduction

The flight test session had to satisfy several requirements and constraints. The round-robin evaluation format required that six sailplanes and seven test pilots must be on site simultaneously. To accomodate the pilots busy flight schedules, the flight session was organized to conduct the flight activities necessary to acquire the required data in a maximum of 7 days. The session was scheduled for the early May period to avoid conflicts with the soaring season, and yet to have the possibility of encountering soaring conditions. In all respects, the flight session was a complete success. There were no problems acquiring the sailplanes, the weather during the flight session was perfect, the test pilots were very enthusiastic, and cooperative, and all operations were conducted safely.

2.2 Evaluation Sailplanes

Within the previously mentioned groups of sailplanes, a ranking was made to determine which one had characteristics of most interest to this investigation. At the same time, only sailplanes with standard approved type certificates were considered. The soaring community was most cooperative in supporting the acquisition of the evaluation sailplanes.

Sailplane 1. This sailplane was chosen since it represents the transition to higher performance ships. It has a fixed horizontal stabilizer with a fairly large chord elevator. The fixed gear is ahead of the center of gravity. The sailplane is equipped with schemmp-Hirth type divebrakes.

Sailplane 2. This sailplane is equipped with camber changing flaps which are inter-connected with the ailerons. The landing gear is retractable and is ahead of the center of gravity. The sailplane has schemmp-Hirth type divebrakes, and a very short, straight control stick. The sailplane is placarded against intentional spins.

Sailplane 3. This sailplane was selected from Group 3. It has an all-moveable horizontal tail and a control stick which curves slightly toward the pilot. The ship is equipped with retractable landing gear ahead of the center

Table 1

Sailplane Dimensional Parameters

Parameters	Units	Sailplane 1	2	3	4	5	6
Wing Span	m	15.0	15.0	15.0	15.0	20.3	17.4
Wing Area	m^2	12.40	9.40	10.00	9.64	14.40	16.72
Aspect Ratio		18.1	23.6	22.5	23.3	28.6	18.0
MAC	m	0.885	0.687	0.704	0.681	0.756	1.069
Max Weight	kg	299	300	300/390	299/422	445/580	649
Wing Loading	n/m^2	234.6	311.2	325.6/383	306.4/430.9	301.6/392.6	378.3
Root Chord	m	1.232	0.940	0.955	0.914	0.980	1.483
Tip Chord	m	0.394	0.343	0.368	0.373	0.350	0.483
Fuselage Length	m	6.680	6.198	6.350	5.842	7.290	8.153
Fuselage Width	m	0.584	0.610	0.635	0.584	0.610	0.813
Hor. Tail Area	m^2	1.65	1.04	0.99	1.00	0.99	2.03
Hor. Tail Span	m	2.819	2.395	2.408	2.032	2.408	3.200
Elevator c_f/c		0.42	0.28	1.00	0.56	1.00	1.00
Vert. Tail Area	m^2	1.13	1.06	0.84	0.78	---	1.43
L/D max (Handbook)		32	39	35.2	37	49	34
Fwd C.G.	$\% \bar{c}$	20	25	26	27.8	29	25
Aft C.G.	$\% \bar{c}$	40	52	47	38.2	45	38
I_{yy} (Approx.)	kg m^2	186	186	204	186	407	1178

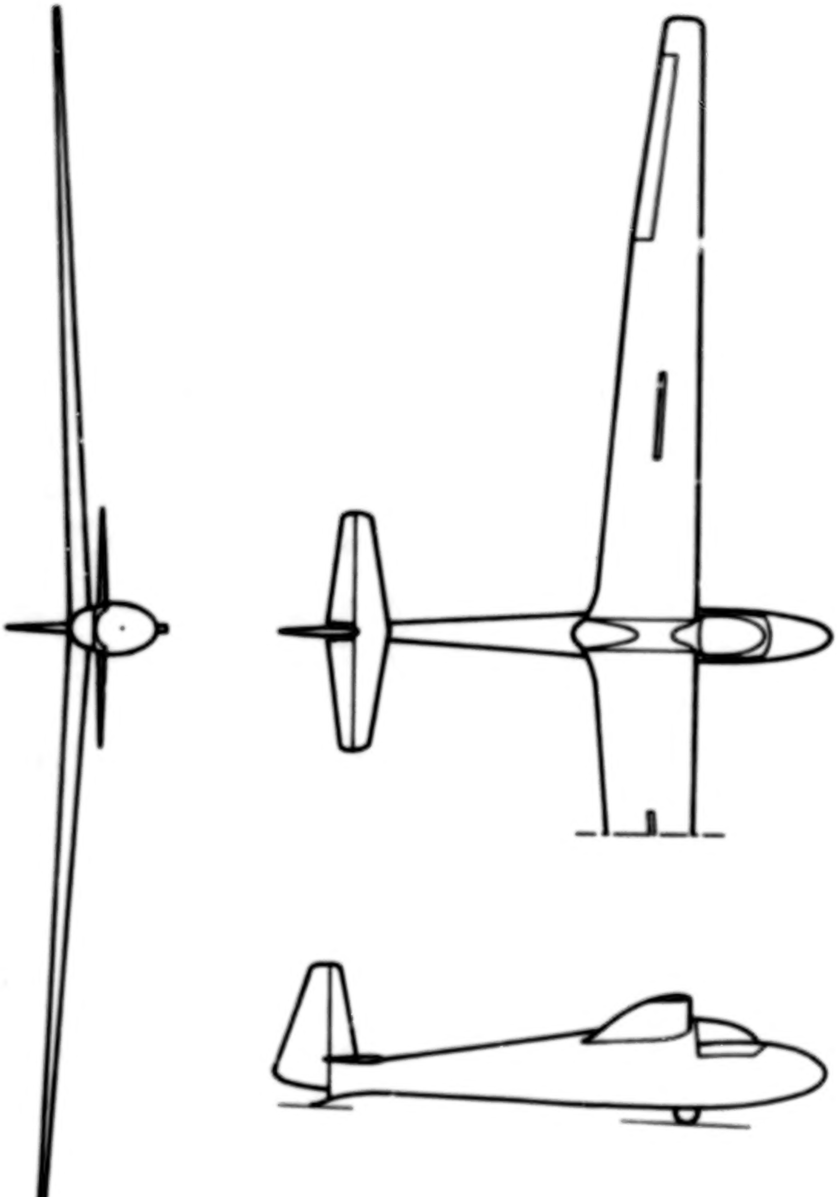

Figure 2. Three View of Sailplane 1.

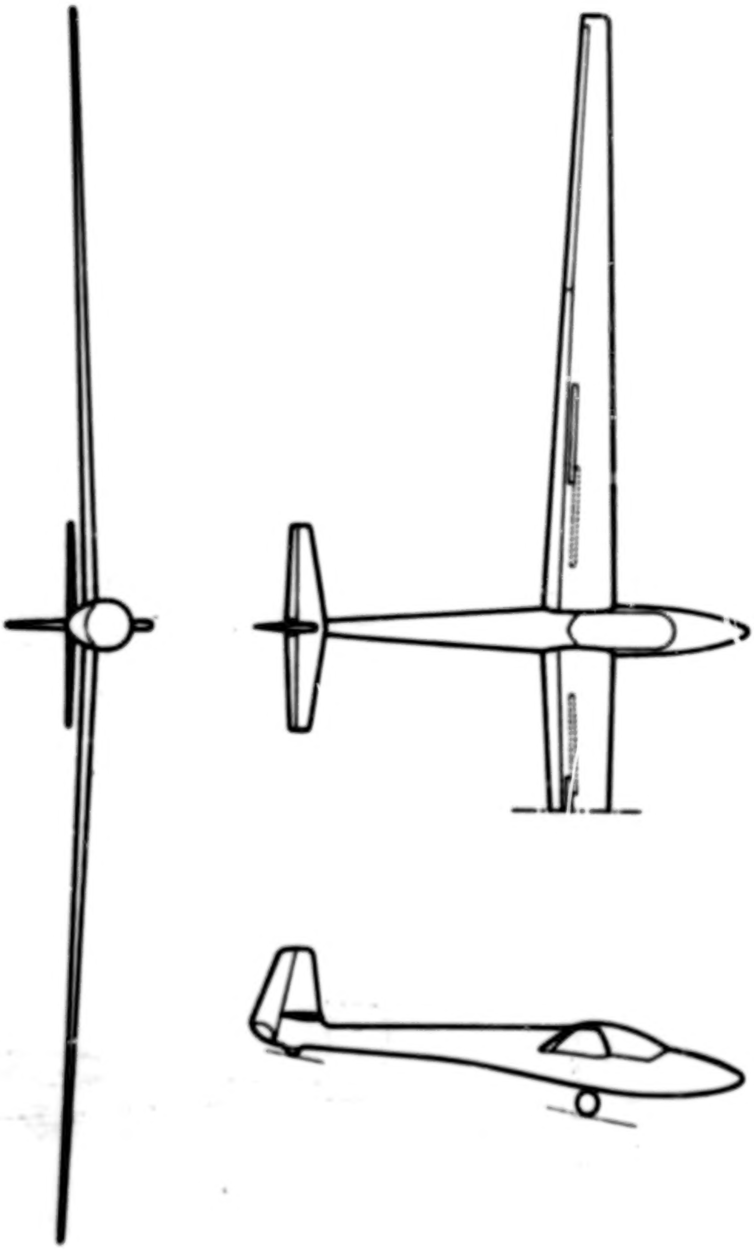

Figure 3. Three View of Sailplane 2.

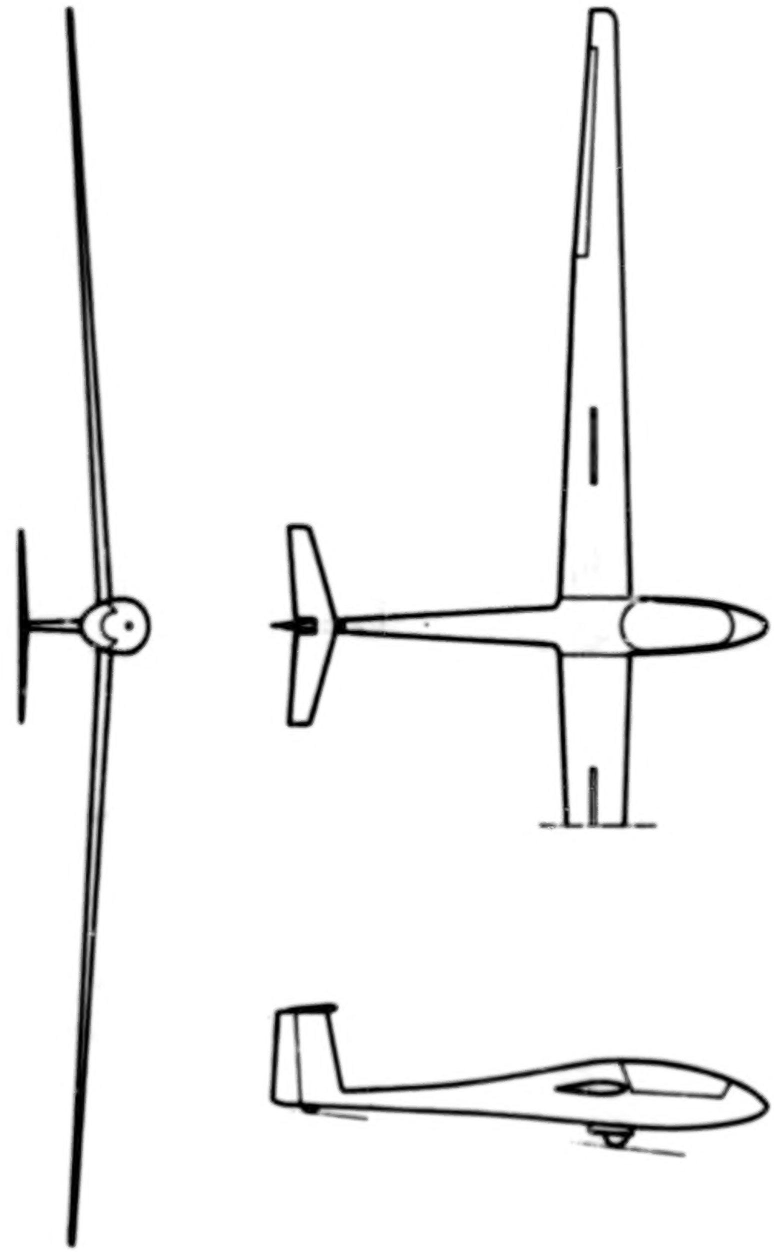

Figure 4. Three View of Sailplane 3.

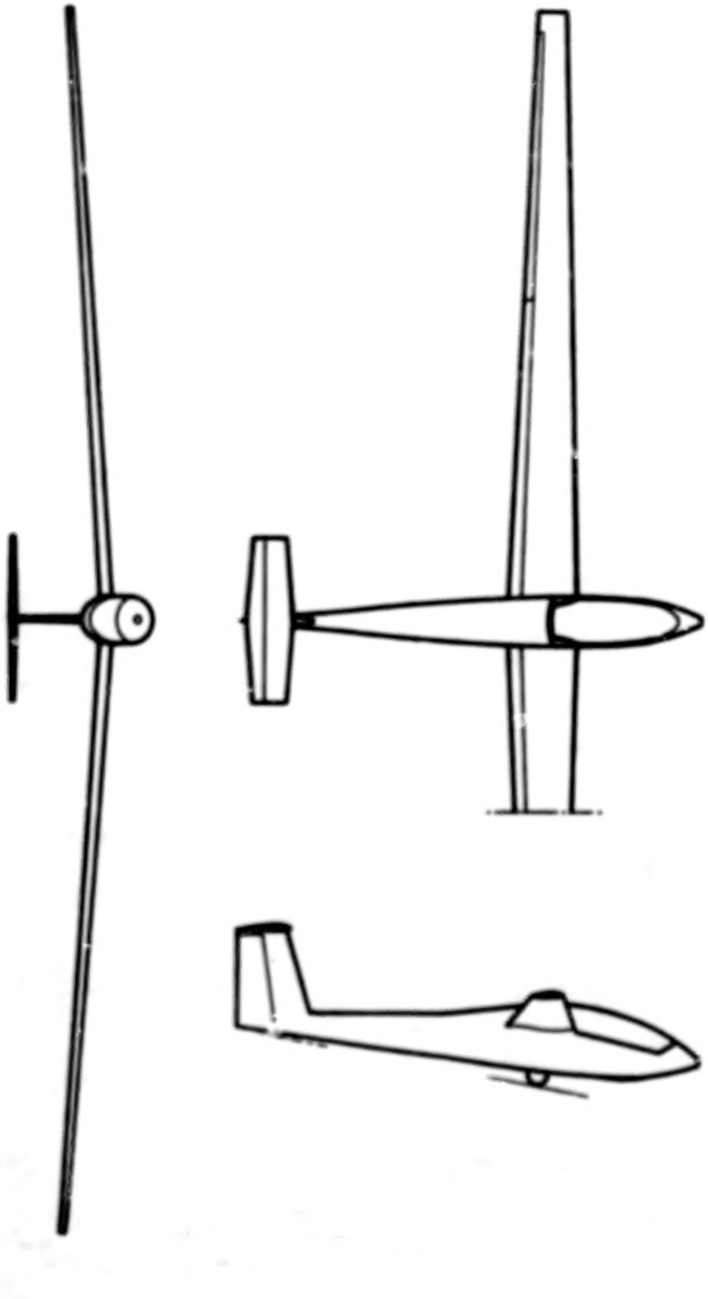

Figure 5. Three View of Sailplane 4.

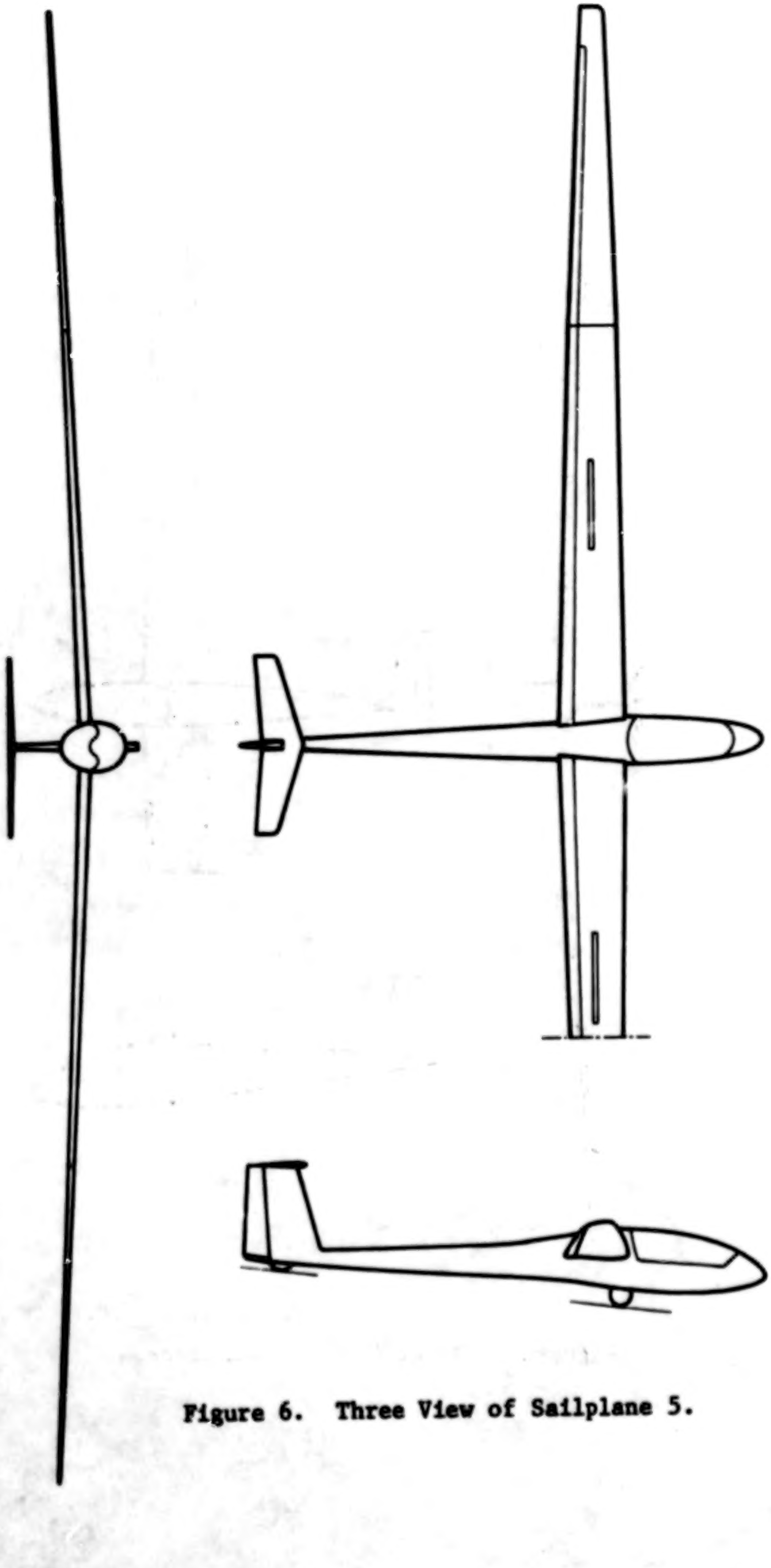

Figure 6. Three View of Sailplane 5.

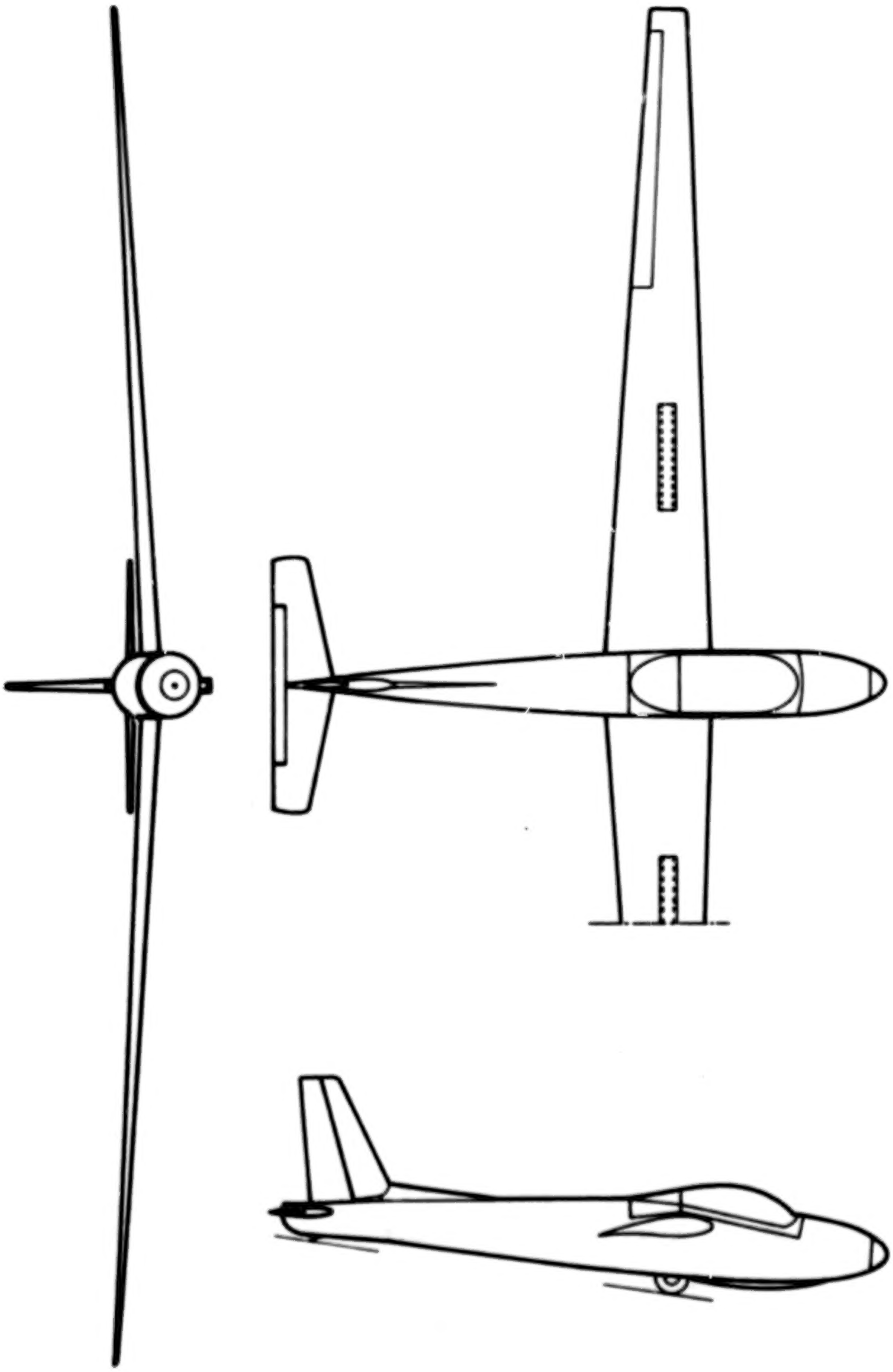

Figure 7. Three View of Sailplane 6.

of gravity, and has upper surface divebrakes. Intentional spins are prohibited with this sailplane.

Sailplane 4. This sailplane has a conventional fixed stabilizer and moveable elevator. The retractable landing gear is located slightly behind the center of gravity. The camber changing flaps, interconnected with the ailerons, can be positioned up to 90 degrees for landing.

Sailplane 5. This ship had the largest wing span among the evaluation sailplanes. The horizontal tail, control stick and landing gear arrangement was identical to that of sailplane 3. This ship is equipped with camber changing flaps interconnected with the ailerons, and with upper surface divebrakes.

Sailplane 6. This sailplane represented a typical, fairly high performance two seater. It features a fixed landing gear, an all moveable horizontal tail equipped with anti-servo tab and large counterbalanced dive brakes.

A three-view drawing of each sailplane is shown in Figures 2 through 7, and the principal geometric characteristics are presented in Table 1.

In general, each sailplane was in excellent mechanical condition. Since in some of the ships intentional spins were prohibited and/or some of the ships were not equipped with water ballast or drag chutes, the effect of these three-factors on the overall sailplane handling qualities was not evaluated.

2.3 Evaluation Pilots

Each evaluation pilot is affiliated with one of the following organizations: Soaring Society of America, Inc., the Federal Aviation Administration and the National Aeronautics and Space Administration. Table 2 indicates the number of flight hours as pilot in command of each pilot. Two of the pilots were professional experimental test pilots and had considerable experience with the Cooper-Harper rating scale. Four of the seven pilots had considerable sailplane cross-country and competition flying experience. Preceeding the flight test sessions, these four pilots were asked to describe to the rest of the group in detail what they conceive to be the flight role or mission of

a high-performance sailplane. Thus, all of the pilots had a clear understanding of the broad mission for which this class of aircraft is designed.

Table 2

Evaluation Pilot Flight Experience

Aircraft Type	Pilot 1	2	3	4	5	6	7
Sailplane	6500	1500	700	30	20	1500	20
SEL	500	500	200	600	200	1000	2450
MEL		1800		2600	3800	5000	1250
Jet Fighter		2500			1000		1500
Jet Transport		450		7000	3500	4000	550
Helicopter		50					250

2.4 Flight Session Preparation

To achieve the objectives of the evaluation session, several tasks were conducted prior to the session. An overriding consideration was the round-robin format for the session which required six sailplanes and seven pilots to be brought together for a one week period. Since the pilots were available for a limited time, it was most important that the sailplanes be properly prepared in advance of the session. A constraint upon the session date was that it must occur early in the year so that the borrowed sailplanes would not be away from the owners during contest activities.

The session data was scheduled for May 1 thru May 6, 1976, so that University students could assist in the flight operations. With the grant awarded February 16, 1976, this session date would allow time for sailplane acquisition, pilot selection, sailplane checkout, instrumentation development and flight session planning. The schedule was tight but all objectives were accomplished.

The acquisition of the sailplanes was found to be much easier than anticipated. A few phone calls to members of the soaring community quickly revealed that the sailplanes of interest were available in the southeastern region of the U.S. The owners were most interested in assisting in this investigation.

Prior to the flight session, all sailplanes except 4 and 5 were acquired with sufficient time for a thorough inspection, airspeed calibration check, and weight and balance check. Sailplanes 4 and 5 were delivered by evaluation pilots and had prior checkout.

Sailplane 6 was acquired early and was used as a testbed for formulating the evaluation tasks and for the development of a simple sailplane data acquisition system. A battery powered signal conditioning unit was developed to give a digital display of either stick position or stick force to the pilot. It was found that small low friction potentiometers could be quickly attached to the sailplane control linkages, but the press of other flight activities and difficulties with pilot data recording limited the utility of quantitative data recording during the flight session. The stick forces were too low for the stick force balance borrowed from Dryden Flight Research Center and also the balance was too bulky for high performance sailplane control sticks.

2.5 Flight Session

The flight session was conducted May 1 through May 6, 1976. The weather was ideal throughout the session with a wide range of convection conditions present. The pilots were allowed to fly each of the ships as required to complete the evaluation questionnaires. Cassette recorders were used to record inflight comments to be used later during the evaluations. A maneuver list was supplied to further support the evaluation.

A total of ninety-eight flights were made for a total of 80 flying hours. The sailplane evaluation forms were completed during the session to maximize evaluation effectiveness. The pilots were most cooperative and willing to participate. The session was very flight intensive, yet all objectives were accomplished without any mechanical or safety problems.

2.6 Pilot Opinion Sampling Instruments and Data Presentation

The primary objectives of this study were to (1) obtain pilot opinion of the handling qualities of current high performance sailplanes, (2) to aid in the formulation of certification criteria, (3) to provide some guidance in future designs, and (4) to delineate areas which require further study. The most cost effective method to accomplish this task was to stage a round-robin

flight session in which seven test pilots evaluated six sailplanes representing distinct groups. The detailed sailplane handling quality pilot opinion data was obtained with a questionnaire which used the Cooper-Harper Rating Scale and pilot comments.

Questionnaire I (Appendix A) was designed to record the pilot's rating and comments of the sailplanes' handling qualities, design and cockpit layout. Each test pilot completed a questionnaire for each sailplane that he flew. The questionnaire was configured to evaluate the pilots' opinion of the sailplane handling qualities over the entire operating envelope from takeoff to landing. Specifically, each flight consisted of a tow to an altitude of 2700 or 3300 meters (AGL) depending on the pilot's preference. Evaluation tasks in smooth air were carried out before the flight reached lower altitudes (1000-1200 meters AGL) where convective conditions were usually encountered. On the average, the duration of each flight was 45 minutes, although some thermalling flight evaluations lasted as long as two hours. Evaluations were made in both smooth air and in thermalling flight to determine if there were any significant pilot opinion differences between the smooth air test conditions and the usual operational environment, that is under convective conditions. A set of maneuvers listed in Table 3 was flown by each pilot to provide a basis for the evaluations. The pilots made comments on cassette recorders during each flight and these comments were transcribed by the pilots to the questionnaires. The questionnaire included evaluations of the design and cockpit layout.

The Cooper-Harper Rating Scale (Reference 2), widely used in the evaluation of handling qualities of powered aircraft, was adopted for this questionnaire. The attractive feature of the Cooper-Harper Rating Scale, Figure 8, is the decision tree structure which guides the pilot to a number for his rating value. For this initial study, the interpretation of the rating scale was broadened to be used in the evaluation of such sailplane characteristics as ease of assembly, inspection, and cockpit layout. The key to this interpretation was the assumption that the pilots would compensate for deficiencies in the design as they would for deficiencies in flight stability and control. It should also be noted that only two of the seven pilots had extensive previous experience with the Cooper-Harper rating scale.

Table 3
Evaluation Flight Tasks

A. Smooth Air Maneuver List

1. Evaluate take-off roll.
2. Evaluate tow characteristics; box tow plane.
3. Release, slow flight, stall entry, general characteristics.
4. Attain and maintain constant IAS:50-70-90 kts. Evaluate trim capability over speed range. Note friction, noise, and vibration level.
5. Evaluate return to trim at 60 and 90 kts IAS.
6. Evaluate stick free stability. Trim at 60 and 90 kts. Introduce 5 kts airspeed perturbation and release stick. Note rate of convergence or divergence, time period of oscillation.
7. Evaluate stick position and force gradients over speed range. Trim at 75 kts, decelerate slowly to near stall then accelerate to 100 kts.
8. Evaluate pitch altitude response to small stick pulses over speed range especially at high speed (may be combined with Item 7).
9. Evaluate stick forces during pull up from high speeds.
10. Time roll rate during turn reversal (from 45° to 45° bank) at min. sink speed and at 65 kts. Evaluate ease of maintaining constant airspeed and coordination (zero sideslip).
11. Evaluate steady sideslip. Note force levels during rudder overbalance.
12. Evaluate constant g turn, 45° bank, 60 kts, L and R.
13. Evaluate constant g turn, 60° bank, 70 kts, L and R.
14. Evaluate flight path control system, pattern, flare characteristics, ease of touchdown control, landing roll.

B. Convective Flight Maneuver List

1. Evaluate takeoff, possibly crosswind effects, and tow characteristics in turbulence.
2. Evaluate stall/spin (incipient spin only) characteristics. Note onset of pre-stall buffet.
3. Thermalling characteristics

   a. Low speed turns
   b. Stall-spin susceptibility, recovery
   c. Control characteristics near other aircraft

4. Interthermal flight evaluation. Fly at max L/D speed plus 10 kts and at rough air airspeed or 100 kts IAS (whichever is lower).
5. Evaluate handling during secondary task.
6. Evaluate glide path control, touchdown and rollout characteristics in turbulence.

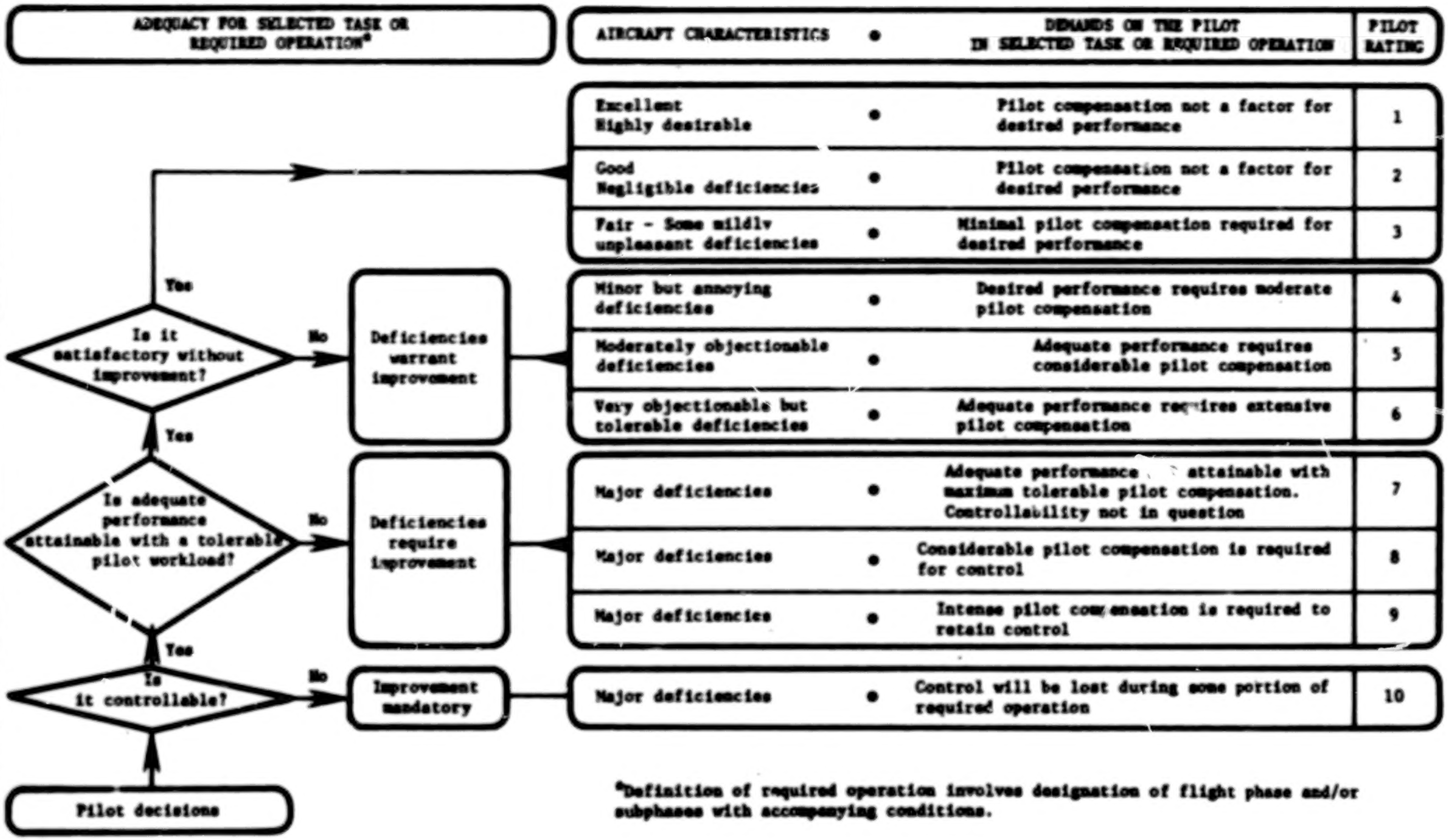

Figure 8. Cooper-Harper Rating Scale

Consequently, the other pilots had a tendency to use the Cooper-Harper Scale as a linear interval scale.

After the flight session was completed, the Cooper-Harper ratings and pilots' comments for each task of Questionnaire I were transcribed into a data file on the university mainframe computer to facilitate the analysis and presentation of the data. The Cooper-Harper Rating Scale, is not a linear scale, thus statistical techniques do not strictly apply. However, averages and standard deviations were computed to gain some measure of the consensus of pilot opinions. An average and standard deviation of all sub tasks for each pilot were computed to allow correlation of the average of sub tasks ratings with the major task rating. The pilots' responses to Questionnaire I are given in Appendix B. The format adopted was to group the responses of all pilots for all sailplanes covering a major area of interest such as longitudinal handling, etc. Extreme caution should be exercised in drawing conclusions from the numerically averaged ratings. As can be seen from the individual pilot ratings, different pilots used different standards of acceptance.

3. RESULTS AND DISCUSSION

3.1 Pilot Rating Summaries

The Cooper-Harper Rating Scale is a valuable tool in the evaluation of aircraft handling qualities. To provide a measure of the variability of the pilot's assignment of ratings, averages and standard deviations for each task were computed for each sailplane. Again, it must be emphasized that the Cooper-Harper Rating Scale is non-linear and thus statistical methods do not strictly apply. Table 4 presents a summary of the average and standard deviation of all pilot ratings of a task for each sailplane. These average readings should not be directly compared with the levels of acceptability shown on the Cooper-Harper scale, but are rather a gross indication. Average Cooper-Harper ratings greater than 3.5 (with no specific meaning attached) have been underlined to delineate areas where problems were noted by most of the pilots. The standard deviations are a measure of the variation in the pilot's rating of a particular task.

Pilot rating numbers without their accompanying pilot comments are of very little value. The individual pilot ratings and comments furnished in Appendix A are rather formidable in their volume and scope. The numerical summaries of Table 4, rather than being accepted by the reader at their Cooper-Harper rating scale face value, should be used as a guide to point out sections of particular interest in the appendix pilot rating information.

Sailplanes 4 and 6 received poor ratings in construction and rigging. Sailplanes 4 and 5 rated down in cockpit layout, sailplanes 3 and 5 in longitudinal handling qualities, and sailplane 6 in stall/spin characteristics. Sailplanes 3, 4, and 5 were given poor ratings in landing characteristics, and sailplane 6 in circling flight. Sailplane 1 received consistently higher ratings than all other aircraft, in every rating category, and was often cited as a benchmark of excellence for sailplane handling qualities. To gain more than this superficial information, the reader must refer to the individual pilot comments in the above areas, which provide an understanding of the reasons for the ratings.

Table 4. Rating Summary for Sailplanes

		SAILPLANE 1		2		3		4		5		6	
TASK		AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV	AVG	STDV
1	I. Design	2.50	.50	2.00	.71	2.00	.71	3.00	1.00	2.00	.00	4.50	2.50
2	A. Pilot Opin. of Const. Rigging	2.00	1.00	1.37	.41	2.25	.43	6.50	.50	1.88	.22	5.50	1.50
3	1. Ease of Inspection	3.00	.82	1.50	.50	2.75	1.30	2.50	.50	1.75	.43	3.00	.00
4	2. Safety of Control System	2.00	.00	2.50	1.12	1.75	.43	3.50	1.50	1.75	.43	2.00	.00
5	3. Ease of Assembly	2.33	.47	1.25	.43	1.75	.43	5.00	1.00	2.00	.00	6.00	1.00
6	B. Pilot Opinion of Cockpit Layout	3.60	.49	2.60	.80	1.80	.75	4.25	1.48	1.70	.60	2.00	1.00
7	1. Pilot Comfort	3.29	.88	2.14	.99	1.14	.35	2.33	.75	1.40	.49	1.67	.75
8	2. Control System Arrangement	3.29	1.39	2.71	.70	3.00	1.41	4.80	1.60	2.75	1.48	2.67	.94
9	3. Instrument Display	2.57	.49	2.33	1.11	1.50	.50	2.00	.63	1.60	.49	2.80	.75
10	4. Pilot Visibility	3.29	.88	1.43	.73	1.86	.83	1.83	1.07	2.00	.89	1.67	.47
11	5. Pilot Safety	3.75	.83	3.50	.50	3.50	1.12	1.60	.49	3.75	1.30	1.00	.00
12	II. Smooth Air Maneuvering	1.12	.22	2.40	.49	2.33	.47	2.70	.00	3.00	1.26	1.25	.43
13	A. Pilot Opin. of Initial Takeoff Roll	1.67	.94	2.75	.99	2.57	.73	2.67	1.60	3.20	1.17	1.80	.75
14	1. Towline Hookup	1.60	.49	2.17	.69	2.33	.94	1.17	.37	2.40	1.02	2.00	1.00
15	2. Control of Plane in Init. Roll	1.79	1.19	3.14	.99	2.57	.73	2.00	.58	3.20	1.17	1.83	1.07
16	B. Pilot Opinion of Tow	1.37	.41	2.20	.75	2.50	.50	2.20	.40	3.50	1.26	1.50	.50
17	1. Ease of Maintaining Position	1.43	.73	2.29	.70	2.29	.70	2.00	.00	2.80	1.33	1.67	.75
18	2. Aircraft Trim	3.50	1.36	2.57	.73	2.43	.49	2.50	1.26	2.20	.40	2.40	1.02
19	3. Control in Propwash	1.43	.73	2.14	.64	1.86	.64	2.17	.37	2.50	1.12	2.00	1.00
20	4. Release Characteristics	1.50	.50	1.67	.47	2.17	.69	1.80	.75	1.75	.43	1.83	.69

Table 4 (Continued)

TASK		Saiplane 1 AVG	1 STDV	2 AVG	2 STDV	3 AVG	3 STDV	4 AVG	4 STDV	5 AVG	5 STDV	6 AVG	6 STDV
21	C. Pilot Opinion of Long. Handling	1.25	.43	2.60	.49	4.10	1.11	3.20	.75	4.20	1.33	2.67	.94
22	1. Ease of Est & Main Con Airspeed	1.57	.90	2.43	.73	2.29	.45	2.67	.47	2.40	.80	2.00	.58
23	2. Plane Trim Sys. Over Speed Range	3.86	.64	3.00	.53	2.33	1.25	2.33	.94	2.60	1.20	2.60	1.02
24	3. Pitch Sensitivity	1.29	.45	2.29	.45	2.71	.70	2.17	.69	3.20	1.17	1.67	.47
25	4. Stick Force Gradient	1.57	.49	2.14	.99	2.29	1.03	3.17	1.07	2.80	1.17	2.33	1.25
26	5. Stick Fixed Stability	1.25	.43	1.50	.50	2.25	.43	2.00	.00	2.00	.00	2.00	.63
27	6. Stick Free Stability	1.17	.37	2.29	1.16	3.43	2.77	2.17	.69	4.20	2.93	2.20	.40
28	7. Return to Trim	1.83	.69	3.17	1.07	3.80	3.19	1.40	.49	4.25	3.42	1.80	.75
29	8. Maneuvering Response	1.29	.45	2.86	.35	2.71	.88	2.17	.90	3.60	1.62	2.00	.58
30	9. Phugoid Characteristics	1.60	.49	2.83	.69	5.29	2.60	2.40	.49	5.40	2.58	2.00	.00
31	10. Dive Recovery	1.71	.45	2.71	.88	4.00	2.00	2.20	.98	3.30	1.78	2.00	.00
32	D. Pilot Opinion of Lateral Handling	1.00	.00	2.80	.75	2.20	.51	2.20	.40	2.60	.80	2.00	.00
33	1. Aileron Force Gradient	1.43	.49	2.14	.64	1.86	.64	2.17	.37	2.20	.40	2.00	.00
34	2. Rudder Force Gradient	1.43	.49	1.86	.83	2.29	1.03	2.17	.37	2.60	.49	2.17	.37
35	3. Roll Rate over Speed Range	2.00	.93	2.14	.35	1.86	.64	2.58	.45	3.30	1.08	2.50	.76
36	4. Sideslip Characteristics	2.00	.76	1.83	.69	2.86	.64	2.17	.50	2.80	.75	2.60	.49
37	5. Ease of Turn Entry	1.29	.45	2.71	.70	1.86	.64	2.00	.58	2.60	1.02	2.20	.75
38	6. Yaw Due to Aileron	2.00	.58	2.67	.75	2.17	.69	2.40	.80	3.00	1.55	2.50	.50
39	7. Yaw Due to Roll	2.00	.63	3.40	.49	2.20	.75	2.25	.43	2.00	.00	2.33	.94
40	8. Ease of Main. 45° Bank Turn	1.43	.73	1.86	.64	1.64	.69	2.00	1.00	1.20	.40	2.58	1.24
41	9. Ease of Main. 60° Bank Turn	1.57	.73	2.14	.64	1.93	.78	2.00	1.00	1.60	.49	2.83	1.07
42	E. Pilot Opin. of Plane Stallspin Char.	1.88	.74	2.20	1.60	2.40	1.02	3.00	.63	2.20	.75	4.33	1.25
43	1. Rudder, Aileron Effect Dur. Stall	2.00	.53	1.86	1.12	1.86	.64	2.33	.75	2.00	.63	3.00	1.15
44	2. Stall Warning	2.43	.49	2.71	1.39	2.43	.90	2.50	.76	2.20	.98	2.33	1.25
45	3. Aggravated Stall-Tend to Spin	2.00	1.00	2.14	1.73	2.57	.90	3.00	.58	2.20	.98	4.00	1.15
46	4. Stick Force Gradient	1.57	.73	2.00	.76	2.57	.73	2.00	1.00	2.60	.49	2.33	1.25
47	5. Stall Recovery, Altitude Loss	1.33	.47	1.67	.75	2.14	.64	1.80	.75	1.80	.75	3.67	1.09
48	6. Spin Entry	1.75	.83	3.00	1.41	2.33	.94	2.67	.47	2.00	.71	4.50	1.12
49	7. Spin Recovery	1.00	.00	1.50	.50	2.00	1.00	1.50	.50	2.50	.50	2.00	1.00
50	8. Stall From Turn at Low Speed	1.50	.50	1.86	1.12	3.67	.47	2.25	1.09	2.00	1.10	4.00	2.52

Table 4 (Continued)

TASK		SAILPLANE 1 AVG	1 STDV	2 AVG	2 STDV	3 AVG	3 STDV	4 AVG	4 STDV	5 AVG	5 STDV	6 AVG	6 STDV
51	F. Pilot Opin. of Plane Landing Char.	1.70	.40	2.75	1.30	3.20	.40	3.50	.50	2.90	[illegible]	2.33	.47
52	1. Pilot Visibility	2.57	.90	1.43	.73	1.43	.49	1.50	.50	1.40	.49	1.00	.00
53	2. Glide Slope Control	1.57	.73	3.00	.93	2.57	.49	2.67	.47	2.40	.49	1.33	.75
54	3. Airs. Control, Airb. Ease of Mod.	2.14	.99	3.14	.99	3.14	.35	4.00	.61	2.60	.49	1.60	.80
55	4. Ease of Land. at Intended Spot	1.57	.49	2.57	.73	2.57	.73	3.87	.40	2.40	.49	1.50	.50
56	5. Ease of Control, Sink at Touch	1.50	.50	2.29	.88	2.43	[illegible]	2.54	.85	2.40	.49	1.80	.40
57	6. Control During Rollout	1.43	.73	2.57	.73	4.00	2.38	1.67	.47	4.00	1.26	1.33	.47
58	III. Flight Characteristics in Convection	1.00	.00	2.50	.71	2.60	.49	2.62	.41	3.20	1.17	3.00	1.22
59	A. Pilot Opinion of Tow	1.50	.76	2.42	.84	2.42	.61	2.00	.00	3.87	1.43	2.25	.43
60	1. Ease of Maintaining Position	1.33	.75	2.50	.96	2.50	.50	2.00	.00	3.00	1.22	2.00	.00
61	2. Response to Vertical Currents	1.83	.69	2.50	.50	2.83	.69	2.00	.00	2.50	.50	2.00	.00
62	3. Release	1.80	.40	1.75	.43	2.00	.63	2.33	.47	2.00	.82	2.00	.00
63	B. Pilot Opinion of Circling Flight	1.00	.00	2.40	.97	2.00	.00	2.87	.74	2.30	.75	4.33	2.62
64	1. Low Speed Handling	1.17	.37	2.83	.90	2.00	.58	2.75	.83	2.40	.49	5.00	2.16
65	2. Stall-Spin Susceptibility	1.75	.38	2.33	1.37	2.00	.58	2.37	.41	1.60	.49	5.33	2.87
66	3. Ease of Centering Thermal	1.83	.69	2.33	.75	2.00	.58	2.75	.43	2.75	1.09	3.33	.47
67	4. Speed Control	1.50	.50	2.17	1.21	2.33	.47	3.25	1.09	2.20	.98	4.33	1.25
68	C. Pilot Opinion of Cruising Flight	1.60	1.20	2.20	.98	2.60	.97	2.37	.65	2.20	.98	1.67	.47
69	1. Ease of Controlling Airspeed	1.67	1.11	2.17	.69	2.33	.94	2.37	.65	2.60	1.36	1.50	.50
70	2. Pull up into Thermal	1.67	.47	2.00	1.15	2.00	.82	2.87	.89	2.00	.63	2.50	1.50
71	3. Ease of Perf. Secondary Tasks	1.50	.50	2.50	1.12	2.00	.82	2.50	.50	3.20	1.94	1.50	.50
72	4. Ride Quality	2.17	.60	2.17	.37	2.73	.56	2.75	.43	1.80	.75	2.50	.50
73	5. Ease of Main. Straight Flight	1.40	.49	2.33	1.11	1.50	.50	1.75	.43	1.60	.80	1.75	.43

3.2 Pilot Evaluation of Ease of Assembly, Inspection and Cockpit Layout

Although these factors are generally not regarded as an essential part of handling qualities, as, say, longitudinal stability, all three characteristics do influence the ease and precision with which the pilot is able to perform tasks for the overall mission of the sailplane. In rating these characteristics, the pilots tended to disregard the dichotomous structure of the Cooper-Harper scale; instead, they were asked to rate these factors on a linear scale from one to ten. Also, three of the pilots did not rate the ease of assembly and inspection since the flight test session did not provide enough time for them to become familiar with these characteristics.

The pilots who rated the ease of assembly and ease of control system inspection generally gave better ratings to the newer machines. These pilot ratings also confirmed the fact that frequent assembly/disassembly is part of the high-performance sailplane role and the ease of assembly should be a very important design objective.

Pilot comments on the cockpit layout show that there were wide variations among the six evaluation sailplanes. The pilots found visibility was adequate in all ships. They singled out poor ventilation, the use of curved control sticks, confusing or unhandy secondary control handles (such as trim and flap handles), need for good pilot protection as areas of concern. The variety of adverse comments indicates the need of some sort of standardization for the location, shape and color of the secondary control handles.

3.3 Pilot Opinion of Longitudinal Characteristics

<u>Takeoff</u>. Average pilot ratings ranged from 1.8 for sailplanes 1 and 6 to 3.2 for sailplanes 2 and 5. Sailplanes 1 and 6 were generally the most stable, had the highest stick forces, and had strong damping of the short period pitching oscillation. Pilots commented that sailplane 2 was more sensitive in pitch than they liked, and that they tended to overcontrol in pitch during takeoff. On sailplane 5, pilots reported disliking the stick bobbing force and aft when rolling over bumps. One pilot felt it necessary to maintain greater ground clearance while he was airborne and waiting for the towplane to accelerate to takeoff speed than with other gliders and that wing flexing resulted in undesirable excursions in fuselage-to-ground

clearance. Although he gave a pilot rating of 2, one pilot noted that on sailplane 4, the longitudinal stick feel-and-trim spring system had high and unsymmetric breakout forces which caused him to overcontrol.

Tow. Again, pilot ratings were best for sailplanes 1 and 6, averaging 1.4 for 1 and 1.5 for 6. The worst average rating was 3.5 for sailplane 5. Pilots strongly objected to inertially induced stick forces, and reported overcontrolling, and a feeling that a serious PIO could occur. When the tow speed was increased from the standard 70 knots to 80 knots, the over-control/PIO tendency was reported more severe. One pilot reported he was unwilling to fly left-handed while raising the landing gear on tow. Sailplane 2 was reported easily upset in rough air, requiring frequent small control corrections. It received several pilot ratings of 3. Sailplane 4 was reported sensitive and easy to overcontrol, receiving pilot ratings of 2 and 3.

Establishing and Maintaining Airspeed. Establishing and holding speed was rated satisfactory for all sailplanes. It was reported by one pilot to be difficult to make fine speed corrections in sailplane 4 due to high breakout forces (his pilot rating was 2 however). For sailplane 5, one pilot reported that a pitch correction tended to continue past the intended point and had to be arrested by a checking control input, (his pilot rating was 4).

Longitudinal Trimming. The trim system on sailplane 1 was rated unsatisfactory. Comments were that it was ineffective and inconvenient. The trim system of every sailplane was reported as inconvenient to use, but only sailplane 1 was rated unsatisfactory. Comments indicated that pilots were content to fly without trimming rather than use inconvenient trim devices, except in the case of sailplane 6 in which stick forces became excessive.

Pitch Sensitivity. Sailplanes 3 and 5 received some pilot ratings of 4 and 5 for oversensitivity. Sailplanes 2, 3, 4, and 5 were described as sensitive, but 2 and 4 did not receive poor pilot ratings for sensitivity.

Stick Force Gradient, Stick Fixed Stability, and Stick Free Stability. These were not tasks, but requests for opinions on the suitabilty of the listed characteristics. In the absence of quantitative data and since the pilot comments were rather general, the responses to these three requests for pilot opinion are broadly summarized: sailplane 1 was well liked; numbers 2, 3, and 5 were characterized as having light stick forces, bordering on too

light, while sailplanes 4, and, even more so, 6, were judged to have too-heavy stick forces.

Return to Trim. The pilots were satisfied with the return-to-trim characteristics of all sailplanes, giving pilot ratings of 2 to 3. An exception to this was pilot 1 who apparently excited the phugoid mode on this test and rated phugoid damping. Two pilots felt the task had no relevance to their opinion of a sailplane's handling qualities. Early NACA flying qualities tests by Gilruth (Reference 3) also showed that the tendency to return to trim speed was relatively unimportant for visual flight.

Maneuver Response. Opinions diverged on the maneuvering responses of the six sailplanes. Sailplane 1, 4, and 6 were well liked by all pilots, receiving mostly 1 and 2 pilot ratings. Sailplane 2 received mostly 3 ratings and comments giving the impression it was more responsive than the pilots liked. Sailplanes 3 and 5 got mixed opinions. Sailplane 3 was rated 4 and sailplane 5 rated 5 due to low or nil stick-force-per-g by some pilots. Delayed g response due to the flexible wing was reported to cause difficulty in stabilizing rapidly applied g by one pilot.

Phugoid Characteristics. This was not a flying task susceptible to pilot rating. Nonetheless pilots expressed their opinions of the suitability of the characteristic. Pilots were satisfied with the lightly damped or neutral stick-free phugoids of sailplanes 1, 2, 4, and 6, while some pilots objected to the strongly divergent stick-free phugoids of sailplanes 3 and 5. The divergent motions appeared to be caused by a dynamical interaction between the sailplane phugoid mode and the pitch control system.

Dive Recovery. Sailplanes 1, 4, and 6 were regarded as satisfactory. Sailplane 2 was given satisfactory pilot ratings, but several comments suggested that it was more sensitive than desired. Sailplanes 3 and 5 were rated unsatisfactory by some pilots who commented that the stick forces were too light, and sometimes reversed during pull-outs.

Ease of Centering Thermal, and Speed Control in Circling Flight. All sailplanes were rated satisfactory for these tasks. Comments indicated that the high stick forces and heavy stability of sailplane 6 caused an undesirably high workload in circling at varying bank angles as is typically done in thermalling flight. On sailplane 3, comments noted that the very low or negative stick-force-per-g was very pleasant to fly and felt immediately

natural and comfortable during the thermalling task. On sailplane 5 the same comments were made, and additionally that in an established thermalling turn the stick could be moved as much as 7 cm aft without appreciably affecting the turn. This later characteristic was not felt objectionable.

Table 5
Sailplane Longitudinal Stability and Control Characteristics

Sailplane	Control Forces	Trim	Static Longitudinal Stab.	Stick-Free Short Per. Damping	Stick Force Per G	Perceived Sensitivity
1	Aerodynamic + Spring	Spring	Moderate	High	Moderate	Moderate
2	"	"	Lo	"	Lo	High
3	Spring + Bobweight	"	"	"	Nil	"
4	Aerodynamic + Spring	"	"	"	Lo	"
5	Spring + Bobweight	"	"	"	Nil	"
6	Aerodynamic	Tab	High	"	Moderate	Moderate

Table 6
Summary of Opinions on Longitudinal Handling Qualities

Sailplane	Takeoff and Tow	Straight Flight	Maneuvering & Dive Pull-Out	Thermalling
1	Well Liked	Well Liked	Well Liked	Well Liked
2	Satisfactory	Satisfactory	Satisfactory	Satisfactory
3	Satisfactory	Well Liked	Satisfactory	Well Liked
4	Satisfactory	Satisfactory	Satisfactory	Satisfactory
5	Satisfactory	Well Liked	Unsatisfactory	Well Liked
6	Well Liked	Well Liked	Well Liked	Satisfactory

Table 5 summarizes the longitudinal stability and control characteristics of the sailplanes evaluated and Table 6 summarizes the pilot opinion of longitudinal handling qualities for primary flight tasks. Table 6 shows that longitudinal characteristics best liked for thermalling are less well liked for takeoff, tow, maneuvering, and dive pull-out. From Table 5 it appears that increased stability and reduced sensitivity are beneficial to the first three tasks while lower stability and greater sensitivity are desirable for the last task. Table 6 shows that all the sailplanes had satisfactory or better longitudinal handling qualities for normal flying and thermalling, and that all but one were also satisfactory for maneuvering and dive pull-out. This was not surprising since all of the evaluation sailplanes were commerically successful in series production.

3.4 Sailplane Lateral-Directional Handling Qualities

Sailplane performance growth has not influenced lateral-directional handling qualities as much as the longitudinal handling qualities, although both have been degraded. The only serious lateral-directional problem apparent in current high performance sailplanes is in takeoff and landing, where low roll control and rudder power can lead to loss of directional control, especially in crosswinds. One cause is the placement of the landing wheel ahead of the C.G., which increases weather cock tendencies. Another is a raised C.G. coupled with a further aft and lower placement of the tow line attach point, which introduces a significant rolling moment with sailplane heading/tow line misalignment. This problem warrants further study to better define controllability during takeoff and landing.

Although pilot comments did not reflect any serious inflight problems, improvement in lateral-directional handling qualities, such as roll response quickening, increased roll control power, and reduction in rudder coordination requirements, would enhance performance in soaring flight, due to the importance of quickly acquiring and centering the thermals and of reducing pilot workload. Informal discussions with the evaluation pilots, as well as reported pilot comments, support this conclusion. Pilot opinions were mostly in the "excellent" to "minor but annoying deficiencies" region (pilot ratings 1 to 4).

Sailplane 1 was "excellent" to "good" (pilot rating 1 to 2) in almost every area. Pilot comments emphasized the good control harmony between rudder and aileron and ease of rudder-aileron coordination. Spiral stability was neutral, which was noted as beneficial for thermalling flight.

Sailplane 2 pilot ratings ranged from 2 to 4, with many comments about high rudder coordination workload in maintaining ball-in-the-center flight, both in turns and turn entries as well as level flight. Inadequate rudder control power was cited, as evidenced by insufficient rudder to maintain balanced flight in moderate rate turn entries. Spiral stability was slightly negative in thermalling configuration, which increased rudder-aileron coordination problems. Lateral-directional characteristics for this sailplane could be summarized as distracting and irritating. One pilot commented negatively on pitchup with sideslip, which is peculiar to this sailplane.

Pilot ratings for sailplanes 3, 4, and 5 fell in the 1 to 4 range. In average overall pilot ratings, sailplane 3 was slightly better than sailplanes 4 and 5, but ratings for each sailplane showed different areas of emphasis, as indicated in the following paragraphs.

Sailplane 3 lateral-directional control harmony and coordination was good. Comments ranged from "no problem" to "pleasant". Comments showed, however, that sailplane 1 was better. A comment for sailplane 3 on aileron effectiveness was that ailerons remained very effective even below stall speed.

The only complaints for sailplane 4 were due to the requirement for considerable top aileron in turning flight and mild objection to coordination workload in lateral maneuvering.

Sailplane 5 received good to excellent ratings for its ease of control in maintaining desired bank angles in turning flight. Several pilots objected to its low maximum roll rate of about 15 deg/sec, about 5 deg/sec less than that of all the other sailplanes, though 2 pilots commented that roll rate was surprisingly good for a sailplane of this large a wing span. Other comments indicated that the rudder force gradient was too high and noted too wide a deadband around neutral for airplane response to rudder inputs.

Sailplane 6 was judged as a training sailplane, suitable for transitioning into high performance ships. In this context, it received very good ratings, except for ease of maintaining desired bank angles and for control near the stall. Concerning turning flight, pilots commented that rudder forces were

too high relative to longitudinal stick forces and that unintentional over-controlling in pitch produced frequent pre-stall airframe buffeting. Lateral control near stall was poor due to decaying roll control power with airspeed decrease.

Rudder overbalance, or "rudder lock" was a characteristic common to sailplanes 2, 3, and 5. The pilots did not find this unsafe or even annoying, except on sailplane 5; one pilot gave sideslips a rating of 4 due to this feature, noting that about 180 N pedal force was required to "unlock" the rudder and that large sideslip angles were possible. Control, however, remained good and very little buffeting occurred at the high sideslip angles. This is classified as a minor but annoying deficiency. Rudder overbalance on the other sailplanes required much less pedal force to unlock. It is concluded that although proportionally increasing rudder pedal force with rudder deflection is a desirable characteristic, rudder overbalance is not unsafe unless very high pedal forces or other overruling characteristics are involved. For instance, sailplane 2 encountered overbalance at about 1/2 rudder deflection and sailplanes 3 and 5 at about 3/4 deflection. These conditions were acceptable, but it might be that overbalance of significantly less rudder deflection would be unacceptable.

3.5 Sailplane Stall/Spin Characteristics

Cross-country soaring flight sometimes involves steep turns at low altitudes to take advantage of whatever lift may be available, avoiding landing unless absolutely necessary. Since optimum airspeed for thermalling flight is near the stall speed, stall and incipient spin characteristics are of prime importance in safety of flight.

Stall warning characteristics of the evaluation sailplanes were described as mild for sailplanes 1 through 5 and too much for sailplane 6. The airspeed stall warning band varied from 1 to 3 kts for the first 4 sailplanes, and were often in a form that could be masked by atmospheric turbulence. However, once the stall was recognized, recovery in most cases was easily and quickly effected by merely relaxing aft stick pressure and flying out of the stalled condition with little altitude loss. Sailplane 6, on the other hand, had a wide stall warning airspeed band of 10-12 kts, which caused stall buffet to

occur frequently at thermalling flight airspeeds. The pilots noted that this is an undesirable characteristic because familiarity with the stall warning buffet degrades its effectiveness and tends to cause the pilot to ignore the warning.

As to stall, incipient spin, and recovery characteristics, sailplanes 1, 2, 3, and 5 generally received good to excellent ratings with sailplane 1 being foremost. Good aileron control was noted, even below stall speed, and abused, cross-controlled stalls did not reveal undesirable qualities. Sailplane 4 recovered immediately with relaxation of aft stick force, but two pilots noted a definite autorotative (spin) tendency if recovery was not executed promptly with wing drop. Sailplane 6 showed a tendency to yaw and roll to the left and to pitch down from a cross-control stall and received lower ratings due to this characteristic toward spinning.

3.6 Sailplane Approach and Landing Characteristics

Once committed to landing, sailplanes cannot go up; it follows that one of the primary considerations in evaluating approach and landing characteristics is ease of glidepath control. Precision in touchdown control is paramount for landing in unprepared and restricted areas, a situation often encountered in cross-country soaring flight. It is therefore not surprising that most of the evaluation sailplanes were criticized for lack of spoiler, flap, or airbrake effectiveness and precision.

Sailplane 6 received the best ratings, in the fair to good category, largely because of the effectiveness of spoilers in controlling glidepath. For instance, one pilot noted that due to dive brake effectiveness, it was easy to make "difficult" landings. "Difficult" here means landings over obstructions into a limited landing area.

Sailplane 1 again received the best rating of all except sailplane 6, although it was noted that the divebrakes were somewhat ineffective. The same comment was made about sailplanes 2, 3, and 5. Sailplane 4 relied only on flaps for glidepath control. This concept was criticized on two points: large changes in pitch attitude with varying degrees of flap extension made precise glidepath control more difficult, and awkward placement, high force requirements, and complex flap control positioning requirements degraded precision of

glidepath control. Some pilots criticized the "suck-open" tendency of spoiler controls on the other sailplanes for the same reasons; the necessity to hold force to restrain spoiler control lever aft movement degraded precise control in pitch with light stick forces, especially if spoiler control forces were high.

It is concluded that more quantitative information should be gathered on primary glide path control capability and also interaction of glide path controls with primary flight controls.

3.7 Pilot Opinion and Certification Criteria

Pilot opinion specifies the characteristics pilots like in sailplanes. Certification criteria specify the characteristics thought by the certifying authority to be essential to their safe operation. There is no reason to expect that pilots will invariably prefer a safer characteristic to one less safe. The contribution to safety of a given characteristic sometimes being recognizable only by a complex analysis or demonstrated in accident patterns. However, in the absence of such analysis or evidence, it would seem sensible that criteria should conform in general to favorable pilot opinion.

General and specific examples of conflicting criteria and pilot opinion follow:

In general, pilots were willing to accept sailplanes that were somewhat more sensitive and less stable in pitch than they liked for take-off, tow, and dive recovery in order to get easy longitudinal maneuvering and low stick forces for soaring flight--the mission of a sailplane. In particular, the criteria specifying a return-to-trim within, say, 10 percent of trim speed was felt to be of no benefit, and when achieved through increased stick centering forces considered to be a harassment. In what way such a criterion is essential to safety is not clear.

The only undesirable characteristic exhibited by some of the high performance sailplanes was marginal control during takeoff and landing. Current certification requirements are vague in this area. A requirement of controllability during takeoff and landing in crosswinds up to a prescribed level would be appropriate.

The requirement that no rudder overbalance occur was considered by some pilots to be overly restrictive. They argued that the natural instinct to straighten out would be sufficient to cue the pilot to overcome the mild overbalance that commonly occurs on gliders at large sideslip angles.

The sailplanes flown illustrated the ways in which stalling behavior desirable for sailplanes differs from that desirable for power planes. First, pre-stall warning was found to be of little or no value because of the normal course of thermalling, the stall boundary is commonly exceeded--an alarm quickly loses its value when often sounded. In any case, regardless of the presence or absence of any pre-stall warning, the considerable loss of climb that would result from reacting to every momentary gust-induced stall warning is unacceptable to most sailplane pilots. They will maneuver as the thermal demands and accept brief occasional stalls. Because occasional stalls must be accepted, it is important that only the least reduction in angle-of-attack be sufficient to achieve an immediate unstall, and that very little loss in altitude and very minor upset accompany the stall. Fortunately, this was just the behavior observed for all the sailplanes except sailplane 6 which had considerable altitude loss and some roll and yaw upset. For deeper or more prolonged or abused stalls, traditional criteria appeared acceptable. Thus, a modification to the traditional criteria such that the initial stall replaced buffet as a warning, and the deeper or aggravated stall be treated as the stall for purposes of certification.

The drag modulation observed on the test sailplanes was felt to be generally insufficient and the operating forces for the drag devices were felt to be generally undesirable for both flaps and airbrakes. Additionally, the variation of divebrake or flap effectiveness during the flare, float and touchdown phase was felt to degrade the pilots' ability to control his landing accuracy. In view of the importance of accurate landings for sailplanes, it was felt that a rational basis should be established for future criteria.

4. CONCLUDING REMARKS

The handling qualities of six sailplanes were evaluated by seven pilots in a flight test session consisting of 98 flights. The term "handling qualities" was defined to be those broad characteristics or attributes which influence the ease and precision with which the pilot is able to perform tasks for the overall misssion of the sailplane. In this context the evaluation pilots were instructed to regard cross-country flight under visual flight rules as the principal mission of the sailplane.

Sailplane characteristics were evaluated using the Cooper-Harper rating scale with additional comments. The pilot opinion data indicates the following:

1. The evaluation sailplanes were found generally deficient in the area of cockpit layout. Poor cockpit ventilation, the use of curved control stick, confusing secondary control handles and the need for better cockpit crashworthiness were cited as reasons for deficiency.
2. The pilots indicated general dissatisfaction with pitch sensitivity which in some cases was coupled with inertially induced stick forces. While all sailplanes were judged satisfactory for centering thermals and in the ease of speed control in circling flight, pilot opinions diverged on the maneuvering response, pull-out characteristics from a dive, and on phugoid damping. The pilots found that the tendency to return to trim airspeed is relatively unimportant for visual flight.
3. Lateral-directional control problems were noted mainly during takeoff and landing. Pilot comments indicate the desirability of overall improvements in roll response quickening, increasing roll control power and reduction in the rudder coordination requirement. Existing levels of rudder overbalance or "rudder lock" was not found unsafe or even annoying.
4. Five of the evaluation sailplanes had very narrow airspeed band in which perceptible stall warning buffet occurred. This was not objectionable, however, since stall recovery was easy. The pilots objected to the characteristics of wide airspeed band of stall warning followed

by a stall with yawing and rolling tendency and substantial loss of altitude during the stall.

5. Landing characteristics of the evaluation sailplanes were found generally objectionable. Ineffective divebrakes, and the necessity of exerting a force to restrain divebrake control lever were quoted by some of the pilots. Flap type glide path control was also rated deficient due to the large attitude changes accompanying flap deflections and to the excessive flap actuation forces.

The present study shows the need for a more quantitative investigation of the factors influencing pitch control sensitivity such as precise measurements of stick forces due to both the aerodynamic hinge moments and the bobweight effects arising from the different horizontal tail configurations. Further study is required of lateral-directional control during takeoff and landing. More quantitative information should be gathered also on the various glide path control systems and the interaction of glide path controls with primary flight controls.

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Appendix A
Pilots' Questionnaire

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Appendix A.

Questionnaire

SAILPLANE EVALUATION

Pilot____________________ Sailplane____________________

Date____________________ Flight No.____________________

I. Design. . . . . ☐

A. Pilot Opinion of Construction & Rigging. . . . . ☐

1. Ease of Inspection. . . . . ☐

2. Safety of Control System. . . . . ☐

3. Ease of Assembly. . . . . ☐

4. Comments____

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B. Pilot Opinion of Cockpit Layout. . . . . ☐

1. Pilot Comfort. . . . . ☐

2. Control System Arrangement. . . . . ☐

3. Instrument Display. . . . . ☐

4. Pilot Visibility. . . . . ☐

5. Pilot Safety. . . . . ☐

6. Comments____

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II. Smooth Air Maneuvering. ☐

A. Pilot Opinion of Initial Takeoff Roll. . . . . ☐

1. Towline Hookup. . . . . ☐

2. Control of Sailplane During Initial Roll. . ☐

3. Comments____

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B. Pilot Opinion of Tow. . . . . ☐

1. Ease of Maintaining Position. . . . . ☐

2. Aircraft Trim. . . . . ☐

3. Control in Propwash. . . . . ☐

4. Release Characteristics. . . . . ☐

5. Comments____

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C. Pilot Opinion of Longitudinal Handling. . . . . ☐

1. Ease of Establishing and Maintaining a Constant Airspeed. . . . . ☐

2. Sailplane Trim System Over Speed Range. . . ☐

3. Pitch Sensitivity. . . . . ☐

4. Stick Force Gradient. . . . . ☐

5. Stick Fixed Stability. . . . . ☐

6. Stick Free Stability. . . . . ☐

7. Return to Trim. . . . . ☐

8. Manoeuvering Response. . . . . ☐

9. Phugoid Characteristics. . . . . ☐

10. Dive Recovery. . . . . ☐

11. Comments ______________________________________

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D. Pilot Opinion of Lateral Handling. . . . . ☐

1. Aileron Force Gradient. . . . . ☐

2. Rudder Force Gradient. . . . . ☐

3. Roll Rate Over Speed Range. . . . . ☐

4. Sideslip Characteristics. . . . . ☐

5. Ease of Turn Entry. . . . . ☐

6. Yaw Due to Aileron. . . . . ☐

7. Yaw Due to Roll. . . . . ☐

8. Ease of Maintaining 45° Bank Turn. . . . . . ☐

9. Ease of Maintaining 60° Bank Turn. . . . . . ☐

10. Comments ______________________________________

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E. Pilot Opinion of Sailplane Stall-Spin Characteristics ☐

1. Rudder and Aileron Effectiveness During Stall ☐

2. Stall Warning. . . . . ☐

3. Aggravated Stall-Tendency to Spin. . . . . . ☐

4. Stick Force Gradient. . . . . ☐

5. Stall Recovery, Altitude Loss. . . . . ☐

6. Spin Entry. . . . . ☐

7. Spin Recovery. . . . . ☐

8. Stall From Turn at Low Speed. . . . . ☐

9. Comments____

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F. Pilot Opinion of Sailplane Landing Characteristics. . ☐

1. Pilot Visibility. . . . . ☐

2. Glide Slope Control. . . . . ☐

3. Airspeed Control, Airbrake Ease of Modulation ☐

4. Ease of Landing at Intended Spot. . . . . . . ☐

5. Ease of Controlling Sink at Touchdown. . . . ☐

6. Control During Rollout. . . . . ☐

7. Comments____

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III. Flight Characteristics in Convection. . . . . ☐

A. Pilot Opinion of Tow. . . . . ☐

1. Ease of Maintaining Position. . . . . ☐

2. Response to Vertical Currents. . . . . ☐

3. Release. . . . . ☐

4. Comments____

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B. Pilot Opinion of Circling Flight. . . . . ☐

1. Low Speed Handling. . . . . ☐

2. Stall-Spin Susceptibility. . . . . ☐

3. Ease of Centering Thermal. . . . . ☐

4. Speed Control. . . . . ☐

5. Comments____

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C. Pilot Opinion of Cruising Flight. . . . . ☐

1. Ease of Controlling Airspeed. . . . . ☐

2. Pull up into Thermal. . . . . ☐

3. Ease of Performing Secondary Tasks. . . . . ☐

4. **Ride Quality. . . . .** ☐

5. **Ease of Maintaining Straight Flight. . . . .** ☐

6. **Comments**____

Appendix B
Cooper Harper Ratings and Pilots' Comments

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******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	PILOT 2	PILOT 3	PILOT 4	PILOT 5	PILOT 6	PILOT 7	AVER.	STD DEV
1	I. DESIGN	.00	.00	3.00	.00	.00	2.00	.00	2.500	.500
2	A. PILOT OPIN. OF CONST. & RIGGING	.00	.00	3.00	.00	.00	1.00	.00	2.000	1.000
3	1. EASE OF INSPECTION	.00	4.00	3.00	.00	.00	2.00	.00	3.000	.816
4	2. SAFETY OF CONTROL SYSTEM	.00	2.00	2.00	.00	.00	2.00	.00	2.000	.000
5	3. EASE OF ASSEMBLY	.00	2.00	3.00	.00	.00	2.00	.00	2.333	.471
74	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	2.7 .9	2.7 .5	.0 .0	.0 .0	2.0 .0	.0 .0	2.4	.68

TASK	PILOT	COMMENTS
2	3	NOT AS GOOD AS GLASS SHIPS
3	3	HAVE TO REMOVE OVERWING FAIRING
4	3	GOOD
5	3	MODERATELY EASY
74	6	AFTER ASSEMBLY, INSPECTION IS DIFFICULT AT ELEVATOR AND WING PINS
74	6	/AILERON CONNECTION

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	PILOT 2	PILOT 3	PILOT 4	PILOT 5	PILOT 6	PILOT 7	AVER.	STD DEV
1	I. DESIGN	2.00	1.00	3.00	.00	.00	2.00	.00	2.000	.707
2	A. PILOT OPIN. OF CONST. & RIGGING	1.50	1.00	1.00	.00	.00	2.00	.00	1.375	.415
3	1. EASE OF INSPECTION	2.00	1.00	1.00	.00	.00	2.00	.00	1.500	.500
4	2. SAFETY OF CONTROL SYSTEM	1.00	2.00	3.00	.00	.00	4.00	.00	2.500	1.118
5	3. EASE OF ASSEMBLY	1.00	1.00	1.00	.00	.00	2.00	.00	1.250	.433
74	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.3 .5	1.3 .5	1.7 .9	.0 .0	.0 .0	2.7 .9	.0 .0	1.7	.92

TASK	PILOT	COMMENTS
74	3	
3	3	EXCELLENT
4	2	APPEARS MECHANICALLY OF MARGINAL DURABILITY
4	3	POSSIBLE TO GET AILERON MOVEMENT WITH DISCONNECTED PUSH RODS
5	3	OUTSTANDING
74	3	HAS POOR HISTORY FOR RUDDER ACTIVATION SYSTEM. ELEVATOR, AILERON
74	3	AND FLAP SYSTEM IS EXCELLENT
74	6	AILERONS CONTROL RODS ENDS, CAN BE INSTALLED BUT NOT PINNED.
74	6	OTHERWISE IT IS BY FAR THE BEST ASSEMBLY OF ANY SAILPLANE.

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	PILOT 2	PILOT 3	PILOT 4	PILOT 5	PILOT 6	PILOT 7	AVER.	STD DEV
1	I. DESIGN	2.00	1.00	2.00	.00	.00	3.00	.00	2.000	.707
2	A. PILOT OPIN. OF CONST. & RIGGING	2.00	2.00	2.00	.00	.00	3.00	.00	2.250	.433
3	1. EASE OF INSPECTION	2.00	2.00	2.00	.00	.00	5.00	.00	2.750	1.299
4	2. SAFETY OF CONTROL SYSTEM	1.00	2.00	2.00	.00	.00	2.00	.00	1.750	.433
5	3. EASE OF ASSEMBLY	2.00	2.00	1.00	.00	.00	2.00	.00	1.750	.433
74	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.7 .5	2.0 .0	1.7 .5	.0 .0	.0 .0	3.0 1.4	.0 .0	2.1	.95

TASK	PILOT	COMMENTS
74	3	
1	3	EXCELLENT
3	3	NOT AS EASY AS SAILPLANE 2 OR 5
3	6	UNABLE TO VISUALLY INSPECT AILERON CONNECTORS BEHIND SPAR
4	3	GOOD
5	3	EXCELLENT
74	3	QUALITY OF CONSTRUCTION IS EXCELLENT--AILERON AND AIR BRAKE LINKAGES

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
1	I. DESIGN	.00	.00	4.00	.00	.00	6.00	.00	5.000	1.000
2	A. PILOT OPIN. OF CONST. & RIGGING	.00	.00	5.00	.00	.00	4.00	.00	4.500	.500
3	1. EASE OF INSPECTION	.00	.00	3.00	.00	.00	2.00	.00	2.500	.500
4	2. SAFETY OF CONTROL SYSTEM	.00	.00	5.00	.00	.00	2.00	.00	3.500	1.500
5	3. EASE OF ASSEMBLY	.00	.00	6.00	.00	.00	4.00	.00	5.000	1.000

74 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) .0 .0 .0 .0 4.7 1.2 .0 .0 .0 .0 2.7 .9 .0 .0 3.7 1.49

TASK	PILOT	COMMENTS
79	3	
1	3	LESS DESIRABLE THAN MOST
2	3	GOOD
3	3	FIND BENDING OF HANDLE REQUIRED FOR FLAP ACTUATION OBJECTIONABLE
5	3	MORE DIFFICULT THAN OTHERS
74	6	CANOPY FITS FAIRLY BADLY BEFORE LOCKING. FOUND TRIM AND FLAP HANDLE
74	6	ACTUATION CHARACTERISTICS OBJECTIONABLE.
74	6	ASSEMBLY NOT COMPATIBLE WITH TASK, I.E. FREQUENT ASSEMBLY/DISASSEMBLY
74	6	IN MINIMUM TIME WITH 2-3 PEOPLE

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
1	I. DESIGN	2.00	.00	2.00	.00	.00	2.00	.00	2.000	.000
2	A. PILOT OPIN. OF CONST. & RIGGING	2.00	1.50	2.00	.00	.00	2.00	.00	1.875	.217
3	1. EASE OF INSPECTION	2.00	2.00	1.00	.00	.00	2.00	.00	1.750	.433
4	2. SAFETY OF CONTROL SYSTEM	1.00	2.00	2.00	.00	.00	2.00	.00	1.750	.433
5	3. EASE OF ASSEMBLY	2.00	.00	2.00	.00	.00	2.00	.00	2.000	.000

74 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 1.7 .5 2.0 .0 1.7 .5 .0 .0 .0 .0 2.0 .0 .0 .0 1.8 .39

TASK	PILOT	COMMENTS
79	3	
1	3	OUTSTANDING
5	3	EXCELLENT-EASIER THAN SOME SMALLER SHIPS
74	3	EXCELLENT CONSTRUCTION—FAIRLY LARGE FREEPLAY WAS OBSERVED IN THE
74	3	HORIZONTAL TAIL SURFACE ATTACHMENT
74	6	HEAVY BUT SIMPLE ONCE TECHNIQUE IS UNDERSTOOD

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
1	I. DESIGN	.00	.00	2.00	.00	.00	7.00	.00	4.500	2.500
2	A. PILOT OPIN. OF CONST. & RIGGING	.00	.00	4.00	.00	.00	7.00	.00	5.500	1.500
3	1. EASE OF INSPECTION	.00	.00	3.00	.00	.00	3.00	.00	3.000	.000
4	2. SAFETY OF CONTROL SYSTEM	.00	.00	2.00	.00	.00	2.00	.00	2.000	.000
5	3. EASE OF ASSEMBLY	.00	.00	5.00	.00	.00	7.00	.00	6.000	1.000

74 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) .0 .0 .0 .0 3.3 1.2 .0 .0 .0 .0 4.0 2.2 .0 .0 3.7 1.80

TASK	PILOT	COMMENTS
79	3	
1	3	EXCELLENT
74	3	GOOD SOLID DESIGN, RIGGING IS MORE DIFFICULT THAN MOST, GOOD
74	3	SAFE CONTROL SYSTEM.
74	6	SHIP IS SIMPLY NOT DESIGNED FOR ASSEMBLY/DISASSEMBLY
74	6	NECESSARY FOR A SAILPLANE.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	3.00	3.00	4.00	.00	.00	4.00	4.00	3.600	.490
7	1. PILOT COMFORT	4.00	3.00	4.00	2.00	4.00	4.00	2.00	3.286	.881
8	2. CONTROL SYSTEM ARRANGEMENT	3.00	5.00	3.00	1.00	3.00	4.00	6.00	3.566	1.355
9	3. INSTRUMENT DISPLAY	2.00	5.00	4.00	1.00	4.00	3.00	5.00	3.571	.982
10	4. PILOT VISIBILITY	3.00	3.00	3.00	2.00	4.00	3.00	5.00	3.286	.881
11	5. PILOT SAFETY	3.00	4.00	3.00	.00	.00	5.00	.00	3.750	.829
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	3.0 .6	3.2 .4	3.0 .6	1.7 .4	3.5 .5	3.8 .7	4.0 1.6	3.2	1.01

TASK	PILOT	COMMENTS
6	7	FAIR
7	1	VERY UNCOMFORTABLE
7	3	SIT TOO LOW IN A/C
7	4	RUDDER PEDALS UNDESIRABLE CHANGING TYPE
8	2	STICK HITS LEG WITH FULL AILERON THROW
9	2	FLT INSTRUMENTS GOOD, HOWEVER COMPASS LOCATED TOO FAR FORWARD
9	2	AND ALMOST REQUIRES LIGHT TO SEE NUMBERS
10	4	VISIBILITY DOWN MARGINAL
10	4	SIDES OF COCKPIT TOO HIGH WHICH REDUCES DOWN VISIBILITY
10	5	NOT GOOD AFT OR FORWARD DOWN
11	1	LIGHT WOODEN STRUCTURE
11	4	PILOT PROTECTION MINIMAL
75	3	PILOT COMFORT IS POOR, VISIBILITY IS RESTRICTED SOMEWHAT. INSUFFI-
75	3	CIENT LEG SPACE. TOP HINGED RUDDER PEDALS TAKES SOME GETTING USED
75	4	NEEDS CUSHIONS--LEG INTERFERE WITH FULL AILERON--HARD TO SEE COMPASS
75	5	SEAT BACK NOT PROPERLY DESIGNED. HEAD THROUGH (FISHBOWL) GIVES SOME
75	6	CONCERN ABOUT PILOT PROTECTION. TOP HINGED RUDDER PEDALS UNSATISFAC.
75	7	POOR LATERAL, DOWNWARD AND REARWARD VISIBILITY. STICK TOO FAR FORWARD
75	7	LONG. TRIM CONTROL TOO FAR FORWARD STIRRUP RUDDER PEDALS UNDESIRABLE
75	7	EXCESSIVE AIR LEAKAGE IN COCKPIT SEAL.

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	2.00	2.00	3.00	.00	.00	4.00	2.00	2.600	.800
7	1. PILOT COMFORT	1.00	3.00	4.00	1.00	3.00	2.00	2.00	2.143	.990
8	2. CONTROL SYSTEM ARRANGEMENT	2.00	3.00	3.00	3.00	4.00	2.00	3.00	2.714	.700
9	3. INSTRUMENT DISPLAY	1.00	.00	3.00	1.00	3.00	4.00	2.00	2.333	1.106
10	4. PILOT VISIBILITY	1.00	1.00	1.00	1.00	2.00	3.00	1.00	1.429	.728
11	5. PILOT SAFETY	3.00	4.00	3.00	3.00	4.00	4.00	.00	3.500	.500
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...)	1.6 .8	2.2 1.1	2.8 1.0	1.8 1.0	3.2 .7	3.0 .9	2.0 .7	2.4	1.07

TASK	PILOT	COMMENTS
7	3	NOT VERY COMFORTABLE
7	5	ARM OUTSTRETCHED
8	1	TRIM LEVER IN POOR LOCATION--STICK TOO FAR FWD.
8	2	TRIMMER TOO FAR BACK, HARD TO REACH AND HARD TO OPERATE
8	3	AVERAGE
8	5	STICK TOO FAR FWD.
8	6	FACTORY STICK IS OK. TEST SHIP HAD A NON-STANDARD TYPE.
9	3	ELECTRIC VARIO INOPERATIVE
9	6	SHORTAGE OF INSTRUMENT/RADIO SPACE.
10	3	VERY GOOD
11	1	INADEQUATE PILOT PROTECTION DUE TO MINIMAL STRUCTURE
11	3	VERY LIGHT STRUCTURE
11	5	NOT A STRONG FEATURE OF THIS GLIDER.
11	4	SEAT BELT INSTALLATION WAS SUCH THAT SEAT BELT ADJUSTMENT WAS VERY
11	4	DIFFICULT AND PROBABLY IMPOSSIBLE IN FLIGHT.
11	5	POOR PROTECTIVE STRUCTURE. SEAT BELTS HARD TO ADJUST.
75	3	SHORT NON-STANDARD STICK WAS FOUND UNPLEASANT. DIVE BRAKE CAN COME
75	3	OUT OF DETENT EVEN AFTER ADJUSTMENT.
75	4	CONTROL STICK(NON-STD) TOO FAR FWD. TRIM LOCATION POOR, DIFFICULT
75	4	TO REACH THE TRIM LEVER BECAUSE OF NARROW COCKPIT. ALSO TRIM WAS
75	4	FROM DETENT TO DETENT. THE DETENT SPACING WAS SUCH THAT IT DID NOT
75	4	ALLOW TRIM A/C ADJUSTMENTS. RUDDER ADJUSTMENT WAS EXCELLENT.
75	5	GOOD RUDDER ADJUSTMENT.
75	6	SAFETY--ADDITIONAL FIBERGLASS STRUCTURE IN THE FORM OF KEEL OR
75	6	STRINGERS(LONG) WOULD IMPROVE LEG/FOOT SAFETY OF NOSE IMPACT
75	6	INCIDENTS/ACCIDENTS.
75	7	TRIM CONTROL PLACEMENT AWKWARD TO USE

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	2.00	1.00	2.00	.00	.00	1.00	3.00	1.800	.748
7	1. PILOT COMFORT	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.143	.350
8	2. CONTROL SYSTEM ARRANGEMENT	2.00	1.00	2.00	3.00	3.00	5.00	5.00	3.000	1.414
9	3. INSTRUMENT DISPLAY	1.00	.00	2.00	1.00	1.00	2.00	2.00	1.500	.500
10	4. PILOT VISIBILITY	3.00	2.00	1.00	1.00	2.00	3.00	1.00	1.857	.833
11	5. PILOT SAFETY	3.00	3.00	3.00	3.00	3.00	6.00	.00	3.500	1.118
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	2.0 .9	1.7 .8	2.0 .6	1.8 1.0	2.0 .9	3.4 1.9	2.2 1.6	2.2	1.29

TASK	PILOT	COMMENTS
7	3	VERY GOOD, BETTER THAN SAILPLANE 2. COULD USE MORE VENTILATION
8	1	CONTROL STICK, RELEASE LEVER TOO FAR FWD.
8	3	EXCELLENT
8	5	TOW RELEASE HARD TO REACH, BRAKE A LITTLE AWKWARD TO REACH.
8	6	ELEVATOR OFFSET SO THAT POSITIVE CG GIVES UP ELEVATOR INPUT, VERY
8	6	BAD AT SPEED.
9	1	VISIBILITY FWD COULD BE IMPROVED
9	4	NOT EVALUATED
10	1	FWD AND DOWN SLIGHTLY OBSCURED
10	3	VERY GOOD
11	1	COCKPIT CONSTRUCTION MINIMAL IN STRENGTH
11	1	GLASS FUSELAGE POOR ENERGY ABSORBER
11	3	NOT AS GOOD AS SAILPLANE 4
11	4	SEAT BELT INSTALLATION WAS SUCH THAT SEAT BELT ADJUSTMENT WAS
11	4	DIFFICULT. PROBABLY IMPOSSIBLE IN FLIGHT.
11	5	WENT OFF RUNWAY AND OVER A DITCH. NOTHING BROKEN BUT FEELINGS.
11	5	SEAT BELT A LITTLE LOOSE, SO BOUNCED HEAD ON CANOPY. SEAT BELT
11	5	ADJUSTMENT DIFFICULT.
11	6	ADDITIONAL NOSE STRENGTH SHOULD BE ADDED TO PROTECT PILOT'S FEET/LEGS
11	6	IN CASE OF BAD LANDING.
75	3	INSTRUMENT PANEL TOO FAR FWD. ACTUALLY WITH CUSHIONS, THE PANEL
75	3	IS NOT DIRECTLY VISIBLE.
75	3	WOULD BE ACCESSIBLE FOR PEOPLE WITH SHORT REACH.
75	4	TOW RELEASE TOO FAR FROM PILOT. BRAKE HANDLE ON CONTROL STICK
75	4	AWKWARD TO APPLY FULLY WITHOUT MOVING HAND ON CONTROL COLUMN.
75	4	TRIM LOCK(KNOB) SOMETIMES DIFFICULT TO UNLOCK. RUDDER ADJUSTMENT
75	4	AND EASE OF ADJUSTMENT EXCELLENT.
75	7	CANNOT REACH TOW RELEASE--NEED ROPE! CANNOT REACH SWITCHES ON FWD
75	7	PANEL! TRIM CONTROL TIRING AND IRRITATING TO USE.

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	.00	.00	4.00	.00	2.00	6.00	5.00	4.250	1.479
7	1. PILOT COMFORT	.00	2.00	2.00	2.00	2.00	4.00	2.00	2.333	.745
8	2. CONTROL SYSTEM ARRANGEMENT	.00	.00	6.00	3.00	3.00	5.00	7.00	4.800	1.600
9	3. INSTRUMENT DISPLAY	.00	.00	3.00	1.00	2.00	2.00	2.00	2.000	.632
10	4. PILOT VISIBILITY	.00	4.00	1.00	1.00	2.00	2.00	1.00	1.833	1.067
11	5. PILOT SAFETY	.00	2.00	2.00	1.00	1.00	2.00	.00	1.600	.490
75	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	2.7 .9	2.8 1.7	1.6 .8	2.0 .6	3.0 1.3	3.0 2.3	2.5	1.50

TASK	PILOT	COMMENTS
7	3	GOOD
7	4	COCKPIT IS SMALL. MY HEAD ALMOST TOUCHES THE CANOPY WHICH CAN LEAD
7	4	TO SOME BUMPS IN TURBULENCE.
7	5	COMPLEX FLAP CONTROL AWKWARD FOR 1.396RAD FLAP
8	2	FLAPS UNHANDY, COMPLICATED, EXCESSIVE FORCES, SUSCEPTIBLE TO MIS-USE
8	2	(SOARING FLAP NOT PUT UP BEFORE LANDING FLAP OPERATED)
8	3	FLAP HANDLE, TRIM HANDLE, AND BRAKE SHOULD BE IMPROVED
8	4	TRIM CONTROL IS TOO FAR FROM PILOT. FLAP CONTROL IS TOO COMPLICATED
8	4	AND FORCES ARE TOO HIGH AT MAX FLAP SPEEDS.
8	5	THE TRIM CONTROL IS A LITTLE AWKWARD TO REACH AND TO MOVE PRECISELY.
8	6	OPERATION OF FLAP HANDLE REQUIRES ABOUT 80-90 % OF PILOT APPLICATION.
8	6	TOW RELEASE NOT OBVIOUS. LOOKS LIKE AN AIRVENT.
9	3	THERMOMETER NOT NEEDED
75	3	WHILE VISIBILITY AND COMFORT ARE GOOD, THE COCKPIT LAYOUT AND HANDLES
75	3	ARE LESS THAN DESIRABLE. APPEARANCE IS POOR(INTERIOR)
75	7	UNABLE TO USE FULL LANDING FLAP POSITION DUE TO AWKWARD PLACEMENT.
75	7	TRIM CONTROL TOO FAR FWD. ON TOW, BREAKOUT FORCE IN FWD. DIRECTION

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	2.50	2.00	2.00	.00	.00	1.00	1.00	1.700	.600
7	1. PILOT COMFORT	1.00	2.00	2.00	.00	.00	2.00	1.00	1.600	.490
8	2. CONTROL SYSTEM ARRANGEMENT	1.00	.00	3.00	.00	.00	6.00	1.00	2.750	1.479
9	3. INSTRUMENT DISPLAY	1.00	2.00	2.00	.00	.00	2.00	1.00	1.600	.490
10	4. PILOT VISIBILITY	1.00	3.00	1.00	.00	.00	3.00	1.00	2.000	.894
11	5. PILOT SAFETY	3.00	3.00	3.00	.00	.00	6.00	.00	3.750	1.299

75 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...) 2.2 1.0 2.2 .4 2.0 .6 .0 .0 .0 .0 3.4 1.9 1.0 .0 2.2 1.28

TASK	PILOT	COMMENTS
8	1	DRAG CHUTE DEPLOYMENT LEVER IN AWKWARD POSITION
8	1	CONTROL STICK AND RELEASE LEVER TOO FAR FWD
8	2	VERY LARGE COMFORTABLE COCKPIT GENERALLY WELL LAID OUT. TRIMMER IS
8	2	HARD TO OPERATE AND HIGHLY ANNOYING. DRAG CHUTE KNOB SUSCEPTIBLE
8	2	TO INADVERTENT OPERATION.
8	3	EXCELLENT COCKPIT LAYOUT
8	6	ELEVATOR OFFSET SO AS TO GIVE MOMENTUM TO UP ELEVATOR WHEN YOU HIT
8	6	A POSITIVE (G). TOW RELEASE TOO FAR FWD.
10	1	FWD VISIBILITY MARGINAL DURING TOW
10	3	EXCELLENT
10	6	VIEW OF TOWPLANE OK, BUT COULD BE IMPROVED.
11	1	COCKPIT CONSTRUCTION MINIMAL IN STRENGTH
11	3	NOT AS SAFE AS SOME
11	6	EXCESSIVE BALLAST IN NOSE COULD BE CONVERTED INTO GLASS TO IMPROVE
11	6	PILOT'S LEG PROTECTION.
75	3	PILOT COMFORT IS EXCELLENT. VENTILATION SHOULD BE BETTER. VENT AIR
75	3	EXHAUST SHOULD HAVE BEEN PROVIDED.
75	7	EXCELLENT CONTROL PLACEMENT, SEAT DESIGN AND VISIBILITY. FLAP AND
75	7	SPEED BRAKE CONTROLS ARE WELL LOCATED AND CONVENIENT TO USE.

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
6	B. PILOT OPINION OF COCKPIT LAYOUT	.00	.00	3.00	.00	.00	1.00	.00	2.000	1.000
7	1. PILOT COMFORT	.00	2.00	2.00	1.00	1.00	1.00	3.00	1.667	.745
8	2. CONTROL SYSTEM ARRANGEMENT	.00	2.00	3.00	3.00	3.00	4.00	1.00	2.667	.943
9	3. INSTRUMENT DISPLAY	.00	.00	3.00	3.00	2.00	2.00	4.00	2.800	.748
10	4. PILOT VISIBILITY	.00	2.00	1.00	2.00	1.00	2.00	2.00	1.667	.471
11	5. PILOT SAFETY	.00	1.00	1.00	1.00	1.00	1.00	1.00	1.000	.000

75 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,...) .0 .0 1.7 .4 2.0 .9 1.8 .7 1.6 .8 2.2 1.2 2.2 1.2 1.9 .94

TASK	PILOT	COMMENTS
7	3	EXCELLENT
8	3	TRIM WHEEL SHOULD BE ON LEFT
8	4	TRIM WHEEL LOCATED ON WRONG SIDE OF COCKPIT
8	5	STICK TOO FAR FWD., TRIM WHEEL ON WRONG SIDE.
8	6	TOW RELEASE SHOULD BE OFF TO LEFT SIDE; TRIM WHEEL ON LEFT SIDE
8	7	TRIM CONTROL SHOULD BE ON LEFT SIDE OF COCKPIT. STICK TOO FAR FWD
8	7	AT MOST FWD POSITION
9	3	FAIRLY POOR ON THIS GLIDER, SHOULD HAVE COMPENSATED VARIOMETERS
9	4	NON STANDARD
10	3	EXCELLENT
11	3	EXCELLENT
11	7	VERY SUBSTANTIAL COCKPIT STRUCTURE
75	2	TRIM WRONG SIDE AND HARD TO USE
75	3	GOOD, SAFE DESIGN FEATURES IN COCKPIT. I WOULD QUESTION SOME OF THE
75	3	AERODYNAMIC COMPROMISES MADE FOR THE SAKE OF CRASHWORTHINESS
75	6	CONTROL TRAVEL IS MUCH TOO EXTENSIVE FOR RUDDER, AILERON, ELEVATOR,
75	6	AND DIVE BRAKES

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
12	II. SMOOTH AIR MANEUVERING	1.50	1.00	1.00	.00	.00	1.00	.00	1.125	.217
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	1.00	1.00	1.00	.00	3.00	1.00	3.00	1.667	.943
14	1. TOWLINE HOOKUP	1.00	.00	2.00	.00	2.00	1.00	2.00	1.600	.490
15	2. CONTROL OF PLANE IN INIT. ROLL	1.00	1.00	1.00	2.00	4.50	1.00	2.00	1.786	1.191
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.0 .0	1.0 .0	1.5 .5	2.0 .0	3.2 1.3	1.0 .0	2.0 .0	1.7	.97

TASK	PILOT	COMMENTS
76	3	EXCELLENT CHARACTERISTICS IN THIS PHASE OF THE FLIGHT
76	5	ON ONE TOW I HAD FULL FORWARD STICK AND WAS STILL GOING UP WHILE
76	5	TOWPLANE WAS STILL ON GROUND. PROBABLY SHOULD HAVE RELEASED.
76	7	NO PROBLEMS IN TAKE OFF, INCLUDING LIGHT CROSSWIND 9KTS,45DEG TO RWY

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
12	II. SMOOTH AIR MANEUVERING	2.00	2.00	3.00	.00	.00	2.00	3.00	2.400	.490
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	1.50	2.00	3.00	.00	4.00	4.00	2.00	2.750	.990
14	1. TOWLINE HOOKUP	1.00	2.00	2.00	.00	3.00	3.00	2.00	2.167	.687
15	2. CONTROL OF PLANE IN INIT. ROLL	2.00	2.00	4.00	4.00	4.00	4.00	2.00	3.143	.990
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.5 .5	2.0 .0	3.0 1.0	4.0 .0	3.5 .5	3.5 .5	2.0 .0	2.7	.99

TASK	PILOT	COMMENTS
76	2	SOME TENDENCY TO DROP WING AT START. DON'T LIKE TO HAVE TO MOVE
76	2	FLAPS DURING T.O. ROLL(UP AT START, TO NEUTRAL) FLAP OPERATING
76	2	HANDLE EXCELLENT.
76	3	THERE IS A TENDENCY TO DROP A WING ON ROLLOUT. STICK LOCATION IS
76	3	INCONVENIENT.
76	4	INSUFFICIENT RUDDER, LOCATION OF CONTROL STICK, CONTROL STICK SHORT
76	4	TRAVEL, LACK OF CONTROL FORCES, AND LACK OF SAILPLANE 2 EXPERIENCE
76	4	RESULTED IN POOR T.O. CONTROL
76	5	WING ALMOST ALWAYS DRAGGED ON INITIAL ROLL, FELT LIKE NOT ENOUGH
76	5	RUDDER TO STAY LINED UP. STICK TOO FAR FORWARD
76	6	AILERONS INEFFECTIVE AT FIRST EVEN WITH FLAPS IN THE NEGATIVE
76	7	NO PROBLEMS IN TAKEOFF, INCLUDING LIGHT CROSSWIND(9KTS, .785RAD TO RW

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
12	II. SMOOTH AIR MANEUVERING	3.00	.00	2.00	.00	.00	2.00	.00	2.333	.471
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	2.00	3.00	2.00	2.00	2.00	4.00	3.00	2.571	.728
14	1. TOWLINE HOOKUP	3.00	2.00	1.00	.00	2.00	4.00	2.00	2.333	.943
15	2. CONTROL OF PLANE IN INIT. ROLL	2.00	4.00	2.00	2.00	2.00	3.00	3.00	2.571	.728
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	2.5 .5	3.0 1.0	1.5 .5	2.0 .0	2.0 .0	3.5 .5	2.5 .5	2.5	.84

TASK	PILOT	COMMENTS
13	6	PILOT USUALLY PUMPS ELEVATOR
14	1	POOR LOCATION
14	5	PULLED ON ROPE EXTENSION BECAUSE HANDLE TOO FAR FWD.
15	1	VISIBILITY AND DIRECTIONAL CONTROL LIMITED
15	2	CROSS WIND CAPABILITY MARGINAL
76	1	6,7,9 DIVERGES, TOO DANGEROUS, EXTREME
76	2	RUDDER WEAK DURING ROLL. EASY TO DROP WING TO GROUND
76	3	NO PROBLEM WITH INITIAL TAKEOFF ROLL
76	4	ON TAKEOFF ROLL WITH AIR VENT OPEN, SAND AND ROCKS WERE BLOWN
76	4	THROUGH THE VENT INTO THE COCKPIT BY THE TOWPLANE.

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
12	II. SMOOTH AIR MANEUVERING	.00	.00	2.00	.00	2.00	2.00	2.00	2.000	.000
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	.00	3.00	6.00	1.00	2.00	2.00	2.00	2.667	1.599
14	1. TOWLINE HOOKUP	.00	1.00	2.00	1.00	1.00	1.00	1.00	1.167	.373
15	2. CONTROL OF PLANE IN INIT. ROLL	.00	3.00	2.00	1.00	2.00	2.00	2.00	2.000	.577
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	2.0 1.0	2.0 .0	1.0 .0	1.5 .5	1.5 .5	1.5 .5	1.6	.64

TASK	PILOT	COMMENTS
14	3	EXCELLENT AERODYNAMICALLY, CONFUSING FOR PILOT SINCE HE ALWAYS PULLS
14	3	RELEASE FOR HOOKUP.
15	3	GOOD
76	2	REQUIREMENT TO START T.O. WITH FLAP UP, THEN PUT NEUTRAL IS
76	2	UNDESIRABLE. SOME TENDENCY TO DROP WING AT START OF ROLL
76	3	MOST SERIOUS DEFICIENCY I NOTE IS THE SUDDEN BLOW TO THE TAILWHEEL
76	3	WHEN THE TAILWHEEL BECOMES TAUT
76	4	THERE IS ADEQUATE CONTROL DURING T.O. TO MAINTAIN WINGS LEVEL EVEN
76	4	IN CROSSWINDS OF AT LEAST 10KTS.
76	7	IS ABOUT TWICE THE AFT BREAKOUT FORCE. WHEN THE STICK IS MOVEDD AFT
76	7	TO FWD, THE FWD BREAKOUT FORCE IS RELATIVELY SO HEAVY THAT IT FEELS
76	7	AS IF A STOP HAS BEEN ENCOUNTERED. THIS UNBALANCED BREAKOUT FORCE
76	7	CAUSED ME TO OVERCONTROL IN PITCHDOWN ON ONE TAKEOFF. IT HAS BEEN
76	7	SUGGESTED(PILOT 4) THAT WITH LONG. TRIM CONTROL ALMOST FULL FWD.
76	7	TAS REQD ON TO#), BREAKOUT FORCES ARE UNEVEN FORE AND AFT AS AN
76	7	INHERENT CHARACTERISTIC OF THE FEEL SPRING MECHANISM.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
12	II. SMOOTH AIR MANEUVERING	2.00	5.00	2.00	.00	.00	2.00	4.00	3.000	1.265
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	2.00	4.00	2.00	.00	.00	5.00	3.00	3.200	1.166
14	1. TOWLINE HOOKUP	3.00	2.00	1.00	.00	.00	4.00	2.00	2.400	1.020
15	2. CONTROL OF PLANE IN INIT. ROLL	2.00	4.00	3.00	.00	.00	5.00	2.00	3.200	1.166
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1.2...)	2.5 .5	3.0 1.0	2.0 1.0	.0 .0	.0 .0	4.5 .5	2.0 .0	2.8	1.17

TASK	PILOT	COMMENTS
13	6	RUDDER INEFFECTIVE, FLAP/AILERON MOVEMENT NECESSARY TO CONTROL
13	6	WING LEVEL
14	1	POOR LOCATION
14	6	TOW RELEASE TOO FAR FROM PILOT'S SHOULDER. TOW HOOK TOO FAR AFT
14	6	CAUSING PITCHUP TENDENCY
15	1	VISIBILITY--DIRECTIONAL CONTROL LIMITED
15	2	AILERONS WEAK, RUDDER WEAK, LIMITED CROSSWIND CAPABILITY
76	2	THE USE OF UP-FLAP TO IMPROVE AILERONS IN CROSSWIND IS AN UNDESIRABLE
76	2	PROCEDURAL COMPLICATION. THE UNBALANCED LONGITUDINAL CONTROL
76	2	CIRCUIT CAUSES THE STICK TO BOUNCE FORE AND AFT WHILE ROLLING OVER
76	2	BUMPY GROUND
76	3	NO SIGNIFICANT PROBLEMS. SLIGHT BOUNCE ON TAKEOFF WHICH COULD BE
76	3	ATTRIBUTED TO WING FLEXING, PROBABLY IT WAS PILOT ERROR. IN ANY
76	3	CASE, AFTER LIFTOFF TOWPLANE SHOULD BE FOLLOWED HIGHER THAN WITH
76	3	OTHER SAILPLANES.
76	6	CROSSWINDS A MAJOR PROBLEM. MAX VECTOR PROBABLY ABOUT 15KNOTS.
76	7	NO PROBLEMS ON TAKEOFF(STEARMAN TOW)

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
12	II. SMOOTH AIR MANEUVERING	.00	1.00	1.00	.00	.00	2.00	1.00	1.250	.433
13	A. PILOT OPIN OF INITIAL TAKEOFF RLL	.00	1.00	1.00	.00	3.00	2.00	2.00	1.800	.748
14	1. TOWLINE HOOKUP	.00	4.00	2.00	1.00	2.00	2.00	1.00	2.000	1.000
15	2. CONTROL OF PLANE IN INIT. ROLL	.00	1.00	1.00	1.00	2.00	4.00	2.00	1.833	1.067
76	AVER. AND STD. DEV. OF SUBTASKS(EX 1.2...)	.0 .0	2.5 1.5	1.5 .5	1.0 .0	2.0 .0	3.0 1.0	1.5 .5	1.9	1.04

TASK	PILOT	COMMENTS
13	5	FWD STICK, ARM OUTSTRETCHED
15	6	TAIL HITS THEN NOSE SKID HITS WHEN PILOT OVERCONTROLS PITCH EVER
15	6	SO SLIGHTLY
76	2	EXCELLENT
76	3	EXCELLENT CONTROL DURING INITIAL ROLL AND LIFTOFF
76	7	VERY GOOD CONTROL IN ALL AXES FOR TAKEOFF-ADEQUATE AUTHORITY AND
76	7	RESPONSE.

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPION OF TOW	1.50	1.00	2.00	.00	.00	1.00	.00	1.375	.415
17	1. EASE OF MAINTAINING POSITION	1.00	1.00	1.00	2.00	3.00	1.00	1.00	1.429	.728
18	2. AIRCRAFT TRIM	2.00	5.00	1.00	4.00	4.50	4.00	4.00	3.500	1.336
19	3. CONTROL IN PROPWASH	1.00	1.00	1.00	2.00	3.00	1.00	1.00	1.429	.728
20	4. RELEASE CHARACTERISTICS	1.00	.00	2.00	1.00	2.00	1.00	2.00	1.500	.500
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.3 .4	2.3 1.9	1.3 .4	2.2 1.1	3.1 .9	1.7 1.3	2.0 1.2	2.0	1.27

TASK	PILOT	COMMENTS
17	4	INSUFFICIENT ELEVATOR TRIM. REQUIRES ABOUT 13N CONSTANT PUSH FORCE
17	6	HEADING DOES NOT HUNT. EXCELLENT (FOLLOWING OF TOWPLANE).
18	1	TOO MUCH FORWARD STICK TO MAINTAIN POSITION
18	2	INEFFECTIVE-UNSATISFACTORY
18	3	POOR NONEXISTENT
18	4	MAX TRIM SPEED 45-50KTS, HOWEVER FORCES ARE LIGHT THROUGH SPEED RANGE
19	3	EXCELLENT
77	2	EXTREMELY RESPONSIVE--WELL DAMPED--LIGHT CONTROL FORCES
77	2	GOOD HARMONY--OUTSTANDING
77	3	GLIDER CANNOT BE TRIMMED ON TOW. WOULD BE TIRESOME AS A CROSS-COUNTRY
77	3	TOW
77	5	CONSTANT FORWARD FORCE ON STICK
77	7	TRIM-REQUIRED 13-18N FWD FORCE IN TOW. CONTROL VERY GOOD IN TOW.
77	7	BOXING SAILPLANE IS SIMPLE TASK, WINGS LEVEL(ADEQUATE RUDDER CONTROL)

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPION OF TOW	1.00	2.00	3.00	.00	.00	2.00	3.00	2.200	.748
17	1. EASE OF MAINTAINING POSITION	1.00	3.00	2.00	3.00	3.00	2.00	3.00	2.286	.700
18	2. AIRCRAFT TRIM	1.00	3.00	3.00	3.00	3.00	3.00	2.00	2.571	.728
19	3. CONTROL IN PROPWASH	1.00	2.00	3.00	2.00	3.00	2.00	2.00	2.143	.639
20	4. RELEASE CHARACTERISTICS	1.00	.00	2.00	1.00	2.00	2.00	2.00	1.667	.471
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.0 .0	2.3 .5	2.5 .5	2.2 .8	2.7 .4	2.2 .4	2.2 .4	2.2	.72

TASK	PILOT	COMMENTS
17	4	INSUFFICIENT RUDDER TO BOX TOWPLANE
18	2	EFFECTIVE BUT HARD TO OPERATE
18	3	FRICTION FORCE IS SUFFICIENT
18	4	SUFFICIENT TRIM AVAILABLE HOWEVERR EACH DETENT RESULTED IN AT LEAST
18	4	8KT INCREMENTS
18	5	DIRECTIONAL-COULD NOT BOX TOW VERY WELL
19	5	FAIRLY LARGE AILERON DEFLECTIONS ARE REQUIRED.
19	5	ALWAYS NEED PUSH FORCES ON STICK
20	5	GOOD, QUIET
20	5	TOUCHY IN DIRECTIONAL
77	1	SOME CONCENTRATION REQUIRED FOR DIRECTIONAL-LATERAL CONTROL
77	2	HANDLES EXCELLENTLY. EASILY UPSET BY DRAUGHTS BUT EASILY RESTORED
77	2	BY CONTROLS
77	3	PLEASANT, LIGHT RUDDER FORCES. GEAR RETRACTION FORCES ARE HEAVY,
77	3	UNCOMFORTABLE. SLIGHT OVERSHOOT WHEN MOVING BACK TO CENTER FROM
77	3	THE OUTSIDE. CURIOUS CLICKING NOISE COMING FROM THE BACK IN THE
77	3	RUDDER CIRCUIT. UNPLEASANT STICK FORCES, EXCESSIVE FRICTION. POOR
77	3	VISIBILITY
77	5	HARDEST TO FLY WAS IN ROUGH AIR. HAD TO WORK TO RETURN TO CORRECT
77	5	POSITION.
77	6	NON-STANDARD STICK TOO FAR FORWARD RESULTING IN TROUBLE HOLDING
77	6	NOSE DOWN AT HIGH TOW SPEEDS.
77	7	ADEQUATE RUDDER CONTROL TO BOX TOWPLANE WITH WINGS LEVEL, SMALL BUT
77	7	FREQUENT STICK AND RUDDER INPUTS REQUIRED IN NORMAL TOW.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPION OF TOW	2.00	3.00	2.00	3.00	.00	3.00	2.00	2.500	.500
17	1. EASE OF MAINTAINING POSITION	2.00	2.00	2.00	3.00	3.00	3.00	1.00	2.286	.700
18	2. AIRCRAFT TRIM	3.00	2.00	2.00	3.00	3.00	2.00	2.00	2.429	.495
19	3. CONTROL IN PROPWASH	1.00	2.00	2.00	1.00	2.00	3.00	2.00	1.857	.639
20	4. RELEASE CHARACTERISTICS	1.00	.00	3.00	3.00	2.00	2.00	2.00	2.167	.687
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.7 .8	2.0 .0	2.2 .4	2.5 .9	2.5 .5	2.5 .5	1.7 .4	2.2	.67

TASK	PILOT	COMMENTS
17	1	FWD VISIBILITY LIMITED
17	3	EASY TO MAINTAIN POSITION
17	4	THERE WAS SOME VERTICAL OSCILLATION EACH TIME THERE WAS A SLACK ROPE
17	4	AND THE TOWPLANE TOOK UP THE SLACK. I BELIEVE THIS WAS MORE
17	4	PRONOUNCED BECAUSE OF TOW ROPE HOOKUP LOCATION
17	7	COULD NOT BOX TOWPLANE IN LOW POSITION DUE TO TOWLINE RUB ON FUSELAGE
17	7	BOTTOM
18	1	OVER SENSITIVE LONGITUDINAL CONTROL
18	3	IT CAN BE TRIMMED FOR LONG TOWS
18	4	ADEQUATE, HOWEVER, SOME DIFFICULTY IN ACTUATING TRIM LOCK.
19	1	CONTROL GOOD BUT TOWROPE RUBS SIDE OF FUSELAGE DUE TO LOCATION OF
19	1	RELEASE HOOK
19	3	NO PROBLEM
19	4	DID NOT CHECK BECAUSE OF TOW ROPE HOOKUP LOCATION
20	3	NOISY
20	4	ELEVATOR CONTROL FORCES NEGLIGIBLE. WHEN PULLED UP AND PUSHED OVER,
20	4	ENCOUNTERED NEGATIVE [G(. COULD BE CORRECTED BY THE PILOT BEING
20	4	EXTREMELY LIGHT ON THE CONTROLS OR BY ELIMINATING THE PULLUP-PUSHOVER
20	4	PRIOR TO RELEASE.
77	1	NO COMMENTS, VERY GOOD
77	2	EASY TO OVERCONTROL IN PITCH
77	3	SOLID FEEL, GEAR RETRACTION MORE COMFORTABLE THAN SAILPLANE 2. TOW L
77	3	COMES UP SIDE OF FUSELAGE WHEN BOXING TOWPLANE.
77	5	HELD SAILPLANE OFFSET TO RIGHT SO I COULD SEE AROUND GLARE SHIELD!
77	5	WITH TOWPLANE CENTERED, HAD TO FLY LOW TO SEE OVER SHIELD.
77	6	WITHOUT USE OF RUDDER, NOSE WANDERS ABOUT 3/4 TOWPLANE SPAN. NO PROB.

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPION OF TOW	.00	2.00	3.00	.00	2.00	2.00	2.00	2.200	.400
17	1. EASE OF MAINTAINING POSITION	.00	2.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
18	2. AIRCRAFT TRIM	.00	1.00	4.00	3.00	2.00	4.00	1.00	2.500	1.258
19	3. CONTROL IN PROPWASH	.00	2.00	3.00	2.00	2.00	2.00	2.00	2.167	.373
20	4. RELEASE CHARACTERISTICS	.00	.00	3.00	1.00	1.00	2.00	2.00	1.800	.748
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	1.7 .5	3.0 .7	2.0 .7	1.7 .4	2.5 .9	1.7 .4	2.1	.80

TASK	PILOT	COMMENTS
17	5	THIS SAILPLANE WAS EASY TO LOCK IN POSITION.
18	3	CENTERING SPRING IS ANNOYING
18	4	ADEQUATE BUT DIFFICULT TO ACTUATE TRIM LEVER TO OBTAIN PRECISE
18	4	SETTINGS AND LEVER LOCATED TOO FAR FROM PILOT.
18	5	THE TRIM WAS VERY GOOD
19	3	EXCELLENT BUT NOISY
19	5	FELT SOLID, NOTED DURING TOW THAT NOSE UP BREAKOUT FORCE LESS THAN
19	5	NOSE DOWN. NOSE DOWN FELT LIKE A [STOP[.
20	3	NOISY
77	2	GOOD
77	3	HANDLING DURING TOW IS GOOD, ONLY ANNOYING CHARACTERISTIC IS NOISE
77	6	STRONG POSITIVE TRIM FORCE CAUSES UNWANTED PITCH CHANGES(ATTITUDE)
77	6	ON TOW WHEN HITTING A GUST WHICH INCREASES/DECREASES AIRSPEED.
77	7	RUDDER CONTROL MORE THAN ADEQUATE TO MAINTAIN WING SEMISPAN LATERAL
77	7	OFFSET FROM TOWPLANE WITH WINGS LEVEL

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPION OF TOW	2.00	4.50	2.00	.00	.00	4.00	5.00	3.500	1.265
17	1. EASE OF MAINTAINING POSITION	1.00	3.00	2.00	.00	.00	3.00	5.00	2.800	1.327
18	2. AIRCRAFT TRIM	2.00	2.00	2.00	.00	.00	3.00	2.00	2.200	.400
19	3. CONTROL IN PROPWASH	1.00	2.00	.00	.00	.00	3.00	4.00	2.500	1.118
20	4. RELEASE CHARACTERISTICS	1.00	.00	2.00	.00	.00	2.00	2.00	1.750	.433
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.3 .4	2.3 .5	2.0 .0	.0 .0	.0 .0	2.7 .4	3.2 1.3	2.3	1.00

TASK	PILOT	COMMENTS
17	1	FWD VISIBILITY LIMITED
18	7	TRIMMED ON TOW
19	1	CONTROL GOOD BUT TOWROPE RUBS SIDE OF FUSELAGE DUE TO POS OF RELEASE
19	7	I FELT THAT, IN TURBULENCE, I WAS FAIRLY CLOSE TO A SERIOUS PITCH
19	7	CONTROL PROBLEM AT TIMES(PILOT INDUCED OSCILLATION). I WAS UNABLE
19	7	(AND UNWILLING TO TRY A SECOND TIME) TO RAISE THE LANDING GEAR WITH
19	7	THE RIGHT HAND WHILE FLYING WITH THE LEFT HAND, EVEN IN SMOOTH AIR.
19	7	AS USUAL WITH A VERY SENSITIVE PITCH CONTROL, I WAS VERY CONSCIOUS
19	7	THAT INPUTS AND CORRECTIONS MUST BE KEPT SMALL; THAT LARGE INPUTS
19	7	WOULD BE UNPLEASANT, IF NOT DOWNRIGHT HAIRY.
77	2	TOWS OK AT 70 KTS. AT 80 KTS THE NEGATIVE STICK FORCE/(GC GIVES
77	2	THE IMPRESSION OF HAVING A NEGATIVE(UNSTABLE) STICK FORCE GRADIENT.
77	2	THE STICK MUST BE RESTRAINED IN CENTER POSITION. MOST UNPLEASANT
77	2	ON TOW WHERE PITCH STEERING TASK IS TIGHTER.
77	3	INITIAL TOW SPEED 60KTS. FELT MORE COMFORTABLE WITH ONE NOTCH DOWN
77	3	FLAPS. NO BOXING OF TOWPLANE WAS ATTEMPTED. VERY EASY TO STAY IN
77	3	POSITION.
77	6	WITHOUT FEET ON RUDDER PEDALS, YAWS ABOUT ONE WING SPAN TO EITHER
77	6	SIDE OF TOWPLANE. CONTROLLABLE WITH RUDDER.
77	7	POOR HARMONY; VERY SENSITIVE ELEVATOR WITH RELATIVELY HEAVY,
77	7	SLUGGISH AILERONS. BOXING TOW TO SIDE WITH FULL RUDDER, WINGS LEVEL
77	7	ABOUT 1/2 SEMISPAN FROM TOWPLANE

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
16	B. PILOT OPION OF TOW	.00	1.00	2.00	.00	.00	2.00	1.00	1.500	.500
17	1. EASE OF MAINTAINING POSITION	.00	1.00	2.00	1.00	3.00	2.00	1.00	1.667	.745
18	2. AIRCRAFT TRIM	.00	.00	2.00	2.00	3.00	4.00	1.00	2.400	1.020
19	3. CONTROL IN PROPWASH	.00	1.00	1.00	2.00	2.00	2.00	4.00	2.000	1.000
20	4. RELEASE CHARACTERISTICS	.00	1.00	3.00	1.00	2.00	2.00	2.00	1.833	.687
77	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	1.0 .0	2.0 .7	1.5 .5	2.5 .5	2.5 .9	2.0 1.2	2.0	.91

TASK	PILOT	COMMENTS
17	3	EXCELLENT
17	5	FWD STICK, ARM OUTSTRETCHED
18	3	GOOD
18	6	NOT ENOUGH NOSE DOWN TRIM
18	7	VTRIM MAX 65IAS WITH SINGLE PILOT
19	3	BETTER THAN MOST
20	3	NOISY
77	2	EXTREMELY EASY TO TOW, AILERONS OSCILLATE OSCASIONALLY IN PROPWASH
77	2	OR TURBULENCE--THIS MIGHT ALARM STUDENT
77	3	VERY GOOD TOW CHARACTERISTICS, NOISER THAN OTHERS.
77	5	RUDDER FORCE TOO HIGH FOR GOOD HARMONY
77	7	UNABLE TO TRIM OUT PITCHUP-HAD TO HOLD FWD FORCE CONTINOUSLY. VERY
77	7	GOOD IN HOLDING STABLE TOW POSITION, HOWEVER.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	2.00	1.00	1.00	.00	.00	1.00	.00	1.250	.433
22	1. EASE OF EST & MAIN CON AIRSPEED	1.00	1.00	1.00	3.00	3.00	1.00	1.00	1.571	.904
23	2. PLANE TRIM SYS OVER SPEED RANGE	3.00	5.00	3.00	4.00	4.00	4.00	4.00	3.857	.639
24	3. PITCH SESITIVITY	1.00	1.00	1.00	1.00	2.00	1.00	2.00	1.286	.452
25	4. STICK FORCE GRADIENT	1.00	1.00	2.00	1.00	2.00	2.00	2.00	1.571	.495
26	5. STICK FIXED STABILITY	1.00	1.00	1.00	.00	2.00	.00	.00	1.250	.433
27	6. STICK FREE STABILITY	1.00	1.00	1.00	1.00	2.00	1.00	.00	1.167	.373
28	7. RETURN TO TRIM	3.00	.00	2.00	1.00	2.00	1.00	2.00	1.833	.687
29	8. MANEUVERING RESPSE	1.00	1.00	1.00	1.00	2.00	1.00	2.00	1.286	.452
30	9. PHUGOID CHARACTERISTICS	2.00	.00	2.00	1.00	2.00	1.00	.00	1.600	.490
31	10. DIVE RECOVERY	1.00	2.00	2.00	1.00	2.00	2.00	2.00	1.714	.452
78	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.5 .8	1.6 1.3	1.6 .7	1.6 1.1	2.3 .6	1.6 1.0	2.1 .8	1.7	.96

TASK	PILOT	COMMENTS
22	4	EASY TO OBTAIN, BUT HAD TO HOLD A FORCE AT SPEEDS ABOVE 48KTS.
22	7	VERY EASY TASK
23	2	TRIMMER UNSATISFACTORY
23	3	NOT NEEDED
23	4	MAX TRIM SPEED 48KTS.
23	5	COULD ONLY TRIM TO 61 IAS
23	6	INSUFFICIENT NOSE DOWN TRIM FOR MAX AIRSPEED
23	7	STEADY STATE SPEED WITH FULL FWD TRIM AT 55KTS-NEEDS FULL TRIM CAP.
24	3	EXCELLENT
24	7	NO PROBLEMS AT ALL IN OVER [GC OR UNDESIRABLE RESPONSE
25	3	EXCELLENT
25	7	LIGHT BUT GOOD-RARELY BOTHER TRIMMING WHILE SOARING
26	3	VERY GOOD
27	1	TRIMMER INOPERATIVE
27	3	VERY GOOD
27	7	THISS TO ME IS EVIDENCED BY STICK FORCE GRADIENT
28	1	TRIMMER INOPERATIVE BUT PROBABLY WOULD RETURN TO TRIM
28	3	RAN OUT OF TRIM
29	3	EXCELLENT
30	3	NEUTRALLY STABLE AT 52KTS
30	4	NEUTRAL
30	5	NEUTRAL
31	2	A LITTLE TOO LIGHT STABILITY CAUSES G TO BUILDUP DURING DIVE ACCEL.
31	3	MODERATE STICK FORCE REQUIRED
31	2	15-18N/G IN TURNING FLIGHT AT 52KTS POSITIVE AND OK
78	2	STABILITY INDUCED G DURING DIVE RECOVERY LEADS TO EASE OF OVER G
78	3	EXCELLENT LONGITUDINAL STABILITY, VERY PERCEPTIBLE STICK TRAVEL AND
78	3	FORCE REQUIRED FOR SPEED CHANGE. NON LINEAR RESPONSE DURING PRECISE
78	3	ATTITUDE CHANGE(SLOWER RESPONSE TO PUSH THAN TO PULL).
78	6	STICK FORCE PER [G] EXCELLENT
78	6	STICK VERY FORWARD
78	7	PITCH-ROLL CONTROL AND RESPONSE HARMONY IS VERY GOOD

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	3.00	2.00	3.00	.00	.00	2.00	3.00	2.600	.490
22	1. EASE OF EST & MAIN CON AIRSPEED	2.00	1.00	3.00	3.00	3.00	3.00	3.00	2.429	.728
23	2. PLANE TRIM SYS OVER SPEED RANGE	3.00	3.00	3.00	3.00	3.00	2.00	4.00	3.000	.535
24	3. PITCH SESITIVITY	2.00	2.00	3.00	2.00	3.00	2.00	2.00	2.286	.452
25	4. STICK FORCE GRADIENT	2.00	1.00	4.00	1.00	3.00	2.00	2.00	2.143	.990
26	5. STICK FIXED STABILITY	1.00	1.00	2.00	.00	2.00	.00	.00	1.400	.500
27	6. STICK FREE STABILITY	4.00	1.00	3.00	1.00	1.00	3.00	3.00	2.286	1.161
28	7. RETURN TO TRIM	5.00	.00	3.00	2.00	2.00	3.00	4.00	3.167	1.067
29	8. MANEUVERING RESPSE	3.00	3.00	3.00	3.00	3.00	2.00	3.00	2.857	.350
30	9. PHUGOID CHARACTERISTICS	4.00	.00	2.00	3.00	3.00	3.00	2.00	2.833	.687
31	10. DIVE RECOVERY	1.00	3.00	2.00	3.00	3.00	4.00	3.00	2.714	.881

78 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 2.7 1.3 1.9 .9 2.8 .6 2.3 .8 2.6 .7 2.6 .7 2.9 .7 2.6 .89

TASK	PILOT	COMMENTS
22	3	POORER THAN SOME SAILPLANES
22	4	DIFFICULT TO OBTAIN PRECISE TRIM SPEEDS
22	5	TRIM
23	2	GOOD,BUT MINIMUM INCREMENT TOO LARGE
23	3	POOR TRIM, NOT REALLY NEEDED
23	6	TRIM WAS ADEQUATE IF PRECISE TRIM SPEEDS ARE NOT REQUIRED.
24	3	MORE SENSITIVE THAN OTHERS
24	4	VERY SENSITIVE BUT LACK OF FORCE GRADIENT CAUSES SOME DIFFICULTY
24	4	IN OBTAINING PRECISE PITCH INPUTS
25	3	WIDE FRICTION BAND
25	4	VERY LIGHT FORCE GRADIENT. ALMOST NEUTRAL STATIC LONG. STAB.
26	3	OK
27	3	STABLE FORCE BUT VERY LIGHT
27	4	FORCES VERY LOW, BUT JUST PERCEPTIBLE
27	5	BARELY PERCEPTIBLE GRADIENT
28	2	NOIT CHECKED
28	3	NOT POSSIBLE BECAUSE OF WIDE FRICTION BAND
28	4	VERY GOOD WHEN A/S WAS DISPLACED TO THE HIGH SIDE. VERY POOR WHEN
28	4	A/S WAS DISPLACED TO THE LOW SIDE.
28	6	DOES NOT RETURN, BUT WHO CARES.
28	7	VTRIM 57IAS DFLAP=0-LOW 49 HIGH 74, VTRIM 50 DFLAP=1, LOW 46 HIGH 60
28	7	VTRIM 71IAS DFLAP=1 LOW 58 HIGH 85
29	2	FLEXIBLE WING GIVES SPONGY FEEL
29	3	SENSITIVE
29	4	NO FORCE GRADIENT
29	5	HAVE TO WORK AT COORDINATION, RUDDER WEAK
30	2	LIGHTY DAMPED
30	3	VERY DAMPED PHUGOID
30	4	DURING 1ST FLIGHT DIVERGENT AT HIGHER SPEED. 2ND FLT. NEUTRAL TO
30	4	SLIGHTLY POSTIVE AT TRIM A/S 58 AND 78KTS.
30	5	UNPREDICTABLE, LONG PERIOD, DANGEROUS SOMETIMES, SOMETIMES NEUTRAL
30	5	OR DIVERGE
30	6	SLIGHTLY DIVERGENT
30	7	VTRIM 54IAS PERIOD 28SEC, VTRIM 70IAS PERIOD 46SEC LIGHTLY DAMPED
31	2	VERY LIGHT APPROX 4.5-9N/G
31	4	NO FORCE GRADIENT
31	6	ACCELERATES VERY RAPIDLY WITH NOSE DOWN
78	1	6,7,9 UNDESIRABLE AT HIGH SPEEDS BECAUSE OF DIVERGENCE--NEUTRAL
78	1	AT SPEEDS UP TO 57-61 IAS.
78	3	SENSITIVE IN PITCH, VERY SMALL STICK MOVEMENTS NEEDED TO MAKE PRECISE
78	3	ATTITUDE CHANGES. TRIM WAS SET AT 5TH NOTCH FROM REAR AND LEFT
78	3	THERE FOR MOST OF FLIGHT.
78	6	VERY LIGHT STICK FORCES-VERY LIGHT GRADIENT--OK

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	5.00	5.00	2.50	.00	.00	5.00	3.00	4.100	1.116
22	1. EASE OF EST & MAIN CON AIRSPEED	2.00	3.00	3.00	3.00	2.00	3.50	3.00	2.786	.452
23	2. PLANE TRIM SYS OVER SPEED RANGE	2.00	2.00	2.00	1.00	.00	5.00	2.00	2.333	1.247
24	3. PITCH SESITIVITY	4.00	3.00	3.00	2.00	3.00	2.00	3.00	2.714	.700
25	4. STICK FORCE GRADIENT	1.00	2.00	3.00	1.00	3.00	4.00	2.00	2.286	1.030
26	5. STICK FIXED STABILITY	2.00	.00	2.00	.00	2.00	3.00	.00	2.250	.433
27	6. STICK FREE STABILITY	10.00	2.00	3.00	1.00	3.00	3.00	2.00	3.429	2.770
28	7. RETURN TO TRIM	10.00	.00	3.00	2.00	.00	3.00	1.00	3.800	3.187
29	8. MANEUVERING RESPSE	1.00	4.00	3.00	3.00	3.00	2.00	3.00	2.714	.881
30	9. PHUGOID CHARACTERISTICS	10.00	6.00	3.00	3.00	8.00	3.00	4.00	5.286	2.603
31	10. DIVE RECOVERY	2.00	5.00	2.00	8.00	5.00	3.00	3.00	4.000	2.000
78	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	4.4 3.7	3.1 1.5	2.5 .5	2.7 2.1	3.6 1.9	3.2 .7	2.4 .8	3.1	2.05

TASK	PILOT	COMMENTS
22	2	POOR OPERATING DEVICE
22	5	DURING DESCENT AND TRIMMING AT 60IAS AND HOLDING ELEVATOR CONTROL
22	5	FIXED-NOTED A +-? KT OSCILLATION. SPEED VARIATION WAS CONFIRMED
22	5	BY NOTING SLIGHT A/C OSCILLATION.
22	7	VTRIM 50KTS FRICTION BAND LOW 42 HIGH 53, VTRIM 60KTS LOW 48 HIGH 68
22	7	VTRIM 70KTS LOW 57 HIGH 73
23	3	SHIP GATHERS SPEED QUICKLY. EASY TO MAINTAIN SPEED.
23	4	50 TO 90 IAS
23	5	THIS IS FUNNY,BECAUSE IT FEELS GOOD, BUT CAN'T TAKE HAND OFF FOR LONG
23	6	UNABLE TO TRIM HIGH ENOUGH SPEED. TRIM STOPS ABOUT 80IAS.
24	2	TOO SENSITIVE
24	3	FAIRLY SENSITIVE
24	4	VERY SENSITIVE, BUT LACK OF FORCE GRADIENT CAUSED SOME DIFFICULTY
24	4	IN OBTAINING PRECISE PITCH INPUTS
24	5	EASY TO OVERCONTROL AT HIGH SPEED.
24	7	SENSITIVE BUT NO OVER CGC PROBLEMS.
25	3	LIGHT STICK FORCES NOT UNPLEASANT
25	4	GRADIENT VERY LIGHT
25	5	BARELY PERCEPTIBLE
25	6	GOOD IN SPEED UP. POOR IN BELOW TRIM SPEED.
25	7	LIGHT BUT PERCEPTIBLE
26	2	INSENSITIVE AT LOW SPEED
26	3	FAIRLY GOOD
26	5	SPEED VS. POSITION GOOD.
27	2	NICE
27	3	LOWER THAN MOST, LOW FORCE GRADIENT
27	4	FORCES ARE VERY LOW BUT PERCEPTIBLE
27	5	BARELY PERCEPTIBLE
28	2	NOT CHECKED
28	4	NO RETURN TO TRIM
28	5	FROM HIGH SIDE(90 TO TRIM) GOOD, FROM LOW SIDE (59-65)POOR, BECAUSE
28	5	OF LOW FORCE GRADIENT.
29	3	SENSITIVE
29	5	STICK FORCE/CGC NEUTRAL
30	2	UNSATISFACTORY
30	4	AT 90IAS, PHUGOID QUICKLY DIVERGES. AT 60IAS ALMOST NEUTRALLY STABLE
30	4	TRIM 60 IAS NEUTRAL,.TRIM AT 90 IAS DIVERGENT.
30	5	DIVERGES VIGOROUSLY AFTER 1/2 CYCLE (IN PITCH)
30	7	DIVERGENT-STRONGLY--PERIOD 16SEC AT VTRIM 50 KTS.
31	2	UNSATISFACTORY SLIGHTLY NEGATIVE STICK FORCE/CGC
31	3	NO PROBLEMS
31	4	PULL UP FORCE ABRUPTLY APPLIED TO THE CONTROL STICK RESULTED IN A
31	4	VERY SHARP PITCH UP. WHEN FORCE WAS RELEASED, ELEVATOR CONTROL
31	4	CONTINUED TO MOVE AFT(LIKE ELEVATOR OVER BALANCE) RESULTING IN
31	4	MORE PITCH UP. I THINK FULL UP ELEVATOR WOULD HAVE RESULTED IF I
31	4	HAD NOT RESTRAINED THE STICK MOVEMENT. THIS CONDITION IS NOT GOOD.
78	2	CAN'T LET GO OF STICK ABOVE 70IAS. WILL DIVERGE. NOT NEARLY AS
78	2	UNPLEASANT IN MANEUVERS AS SAILPLANE 5.
78	4	CONTROL STICK FEELS A LITTLE LOOSE, VERY LOW FORCE LEVELS. WHEN
78	4	STICK IS TAPPED FORWARD AT 90IAS, GLIDER NOSE SEEMS TO TUCK UNDER.
78	4	I BELIEVE THE TRUE PHUGOID WOULD HAVE TO BE OBSERVED STICK FIXED.
78	4	I THINK (9) IS A RESULT OF ELEVATOR FLOATING TO AUGMENT PHUGOID.
78	7	STICK FORCE/CGC VERY LIGHT AT 45DEG BANK, NEUTRAL AT 60DEG BANK.
78	7	MAX TRIMMED SPEED 92 KTS. CONTROL SYSTEM FRICTION VERY LOW (GOOD).

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	.00	2.00	4.00	.00	3.00	4.00	3.00	3.200	.748
22	1. EASE OF EST & MAIN CON AIRSPEED	.00	3.00	2.00	3.00	3.00	3.00	2.00	2.667	.471
23	2. PLANE TRIM SYS OVER SPEED RANGE	.00	3.00	2.00	1.00	4.00	2.00	3.00	2.333	.943
24	3. PITCH SESITIVITY	.00	3.00	2.00	1.00	2.00	3.00	3.00	2.167	.687
25	4. STICK FORCE GRADIENT	.00	3.00	4.00	3.00	2.00	3.00	3.00	3.167	1.067
26	5. STICK FIXED STABILITY	.00	2.00	2.00	.00	2.00	2.00	.00	2.000	.000
27	6. STICK FREE STABILITY	.00	2.00	3.00	1.00	2.00	2.00	3.00	2.167	.687
28	7. RETURN TO TRIM	.00	.00	2.00	1.00	1.00	2.00	1.00	1.400	.490
29	8. MANEUVERING RESPSE	.00	2.00	2.00	1.00	3.00	4.00	2.00	2.167	.898
30	9. PHUGOID CHARACTERISTICS	.00	.00	3.00	2.00	3.00	2.00	2.00	2.400	.490
31	10. DIVE RECOVERY	.00	.00	2.00	1.00	2.00	4.00	2.00	2.200	.980

78 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) .0 .0 2.1 .3 2.6 .8 1.6 .8 2.2 .6 2.9 1.0 2.2 .6 2.3 .87

TASK	PILOT	COMMENTS
22	3	OCCASIONAL OVERSHOOT IS EXPERIENCED WHEN CHANGES ARE ATTEMPTED
22	4	IAS EASY TO OBTAIN, HOWEVER, IT IS DIFFICULT TO ACTUATE TRIM LEVER
22	4	FOR MAINTAINING IAS
23	3	HARD TO ADJUST PRECISELY
23	4	ABLE TO TRIM THROUGHOUT REQD TRIM RANGE
24	3	VERY GOOD
24	4	VERY SENSITIVE
25	3	FOUND CENTERING SPRING ANNOYING
25	4	FORCE GRADIENT IS THE RESULT OF WORKING AGAINST SPRINGS. THIS
25	4	RESULTS IN FORCES AS HIGH AS 15-20N, DURING ALL MANEUVERS EXCEPT
25	4	T.O., LANDING, AND STICK FORCE/LGC. VERY LIGHT FORCES WOULD BE
25	4	MORE DESIRABLE.
26	3	LIGHT BUT OK
27	3	NONLINEARITY OBSERVED GOING BACK FROM 57 TO 52 OK. STARTING FROM
27	3	48 OSCILLATION BEGAN. SAME AS STICK FIXED
27	5	POSITIVE STICK FORCE/V GRADIENT
28	2	DID NOT DO
29	3	GOOD
29	3	VERY PLEASANT IF SAME TRIM SPEED IS DESIRED AT END OF MANEUVER
29	4	POSITIVE FORCE GRADIENT WITH LGC.
30	2	OK
30	3	NEUTRAL
30	5	APPEARS NEUTRAL--APPROX. 16SEC PERIOD
30	7	WITHIN 40IAS 20 SEC PERIOD MODERATELY DAMPED
31	2	LIGHT BUT NO SURPRISES
31	3	GOOD NO PROBLEM
31	4	POSITIVE FORCE GRADIENT WITH LGC.
78	4	GIVES IMPRESSION OF LIGHT STABILITY WITH STIFF, INSENSITIVE STICK.
78	5	QUICK, LIGHT BUT CONSISTENT. PLEASANT TO FLY
78	5	WHEN RETURNING FROM OFF TRIM CONDITION, PHUGOID OSCILLATION WAS
78	5	EXCITED IN 2 OF 3 CASES.
78	6	STICK FORCE PER LGC TOO LIGHT. STICK FORCE PER DISPLACEMENT MAY BE
78	6	OK. STICK FORCE GRADIENT PER AIRSPEED TOO HIGH.
78	7	HIGH STICK FORCE GRADIENT IN BOTH 1GC AND MANEUVERING FLIGHT.
78	7	IN FREE FLIGHT, MUCH OF THE REQUIRED PITCH CONTROL ACTIVITY CONSISTS
78	7	OF SMALL DEFLECTIONS AROUND THE STRONG CENTERING SPRING DETENT.
78	7	THE PILOT IS DEPRIVED OF TRUE ANTICIPATORY FEEL FOR AIRPLANE RESPONSE
78	7	TO THESE SMALL INPUTS BY THE ARTIFICIAL BREAKOUT FORCES. THIS IS A
78	7	PROBLEM PREVIOUSLY ENCOUNTERED IN RESEARCH SIMULATORS. IT DOES NOT
78	7	SERIOUSLY AFFECT AIRPLANE CONTROL(WITH POSSIBLE EXCEPTION OF TOW
78	7	TAKEOFF) BUT IT CAUSES HIGHER PILOT WORKLOAD IN ITERATING SMALL
78	7	PITCH INPUTS AND IS IRRITATING.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	5.00	6.00	2.00	.00	.00	4.00	4.00	4.200	1.327
22	1. EASE OF EST & MAIN CON AIRSPEED	2.00	2.00	2.00	.00	.00	2.00	4.00	2.400	.800
23	2. PLANE TRIM SYS OVER SPEED RANGE	2.00	2.00	2.00	.00	.00	5.00	2.00	2.600	1.200
24	3. PITCH SENSITIVITY	4.00	3.00	2.00	.00	.00	3.00	5.00	3.400	1.166
25	4. STICK FORCE GRADIENT	1.00	2.00	3.00	.00	.00	4.00	4.00	2.800	1.166
26	5. STICK FIXED STABILITY	2.00	2.00	2.00	.00	.00	2.00	.00	2.000	.000
27	6. STICK FREE STABILITY	10.00	2.00	3.00	.00	.00	4.00	3.00	4.400	2.939
28	7. RETURN TO TRIM	10.00	.00	3.00	.00	.00	4.00	1.00	4.250	3.419
29	8. MANEUVERING RESPONSE	2.00	6.00	2.00	.00	.00	3.00	6.00	3.600	1.855
30	9. PHUGOID CHARACTERISTICS	10.00	6.00	3.00	.00	.00	3.00	6.00	5.600	2.577
31	10. DIVE RECOVERY	2.00	6.50	2.00	.00	.00	2.00	6.00	3.300	1.778

78 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 4.5 3.7 3.4 2.0 2.4 .5 .0 .0 .0 .0 3.0 .9 3.7 1.3 3.4 2.14

TASK	PILOT	COMMENTS
22	7	PITCH RESPONSE TO CONTROL INPUTS IS LIKE (ACCELERATION COMMAND)-
22	7	(CHECKING) MOTION FOLLOWS MOST STICK INPUTS-OVERSHOOT TENDENCY
23	6	UNABLE TO TRIM TO FULL SPEED. TRIM CAPABILITY STOPS AT ABOUT 75-80KT
24	1	TOO SENSITIVE BUT NOT AS BAD AS SAILPLANE 3
25	2	LIGHT
25	6	EXTREMELY LIGHT
26	7	DIVERGES TOO EXTREME
27	3	POSITIVE STICK FORCES REQUIRED TO CHANGE SPEED.
27	7	EXTREMELY LIGHT GRADIENT
27	7	DIVERGES TOO EXTREME
28	2	C.G. RESPONSE TO STEP ELEVATOR INPUT IS APPRECIABLY DELAYED, MAKING
28	2	TIGHT PITCH STEERING DIFFICULT.
28	3	FRICTION BAND TOO WIDE TO RETURN EXACTLY
28	7	VTRIM 60KT LOW 55 HIGH 66 WITH VTRIM 60KT, AFT STICK FORCE AT 47KT
28	7	IS SEVERAL DYNES, FWD STICK FORCE AT 90KTS IS ABOUT 2.2N.
29	2	IN COMBINATION WITH REVERSED STICK FORCES MAKES FOR POOR MANEUVERING
29	2	CHARACTERISTICS
29	3	EXCELLENT
29	7	DIVERGES TOO EXTREME
30	3	QUICKLY DIVERGES AT HIGH SPEED.
30	6	MILDLY DIVERGENT
30	7	VTRIM (60KT; STRONGLY DIVERGENT-DID NOT LET IT COMPLETE A FULL CYCLE
31	3	NO PROBLEMS FOUND
31	7	DIVE RECOVERY? NEGATIVE FORWEIGHT
78	2	RECOVERING FROM DIVE(100-120KTS) AFTER WINGOVER IS VERY UNPLEASANT.
78	2	THE STICK MUST BE HELD FIRMLY TO RESTRAIN IT. ALTERATIONS IN
78	2	TRAJECTORY MUST BE MADE BY POSITIVELY DISPLACING THE STICK AN
78	2	ESTIMATED AMOUNT AND HOLDING IT RIGID. THIS SHIP CANNOT BE FLOWN
78	2	BY PRESSURE OR FEEL-ONLY BY STICK POSITION.
78	3	AT 90KTS QUICKLY DIVERGENT PHUGOID OSCILLATIONS; SOMEWHAT BETTER
78	3	DAMPING AT 60KTS. LITTLE SLOW ON PRECISE ATTITUDE CHANGES. NO
78	3	UNPLEASANT TRIM CHANGES WITH FLAP SETTING.
78	6	STICK FORCE/G IS GOOD
78	7	TRIM WITH SCREWDOWN KNOB UNCOMFORTABLE AND AWKWARD TO OPERATE
78	7	PHUGOID STRONGLY DIVERGENT-FRICTION VERY LOW IN SYSTEM (GOOD)

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
21	C. PILOT OPIN OF LONG. HANDLING	.00	.00	2.00	.00	.00	4.00	2.00	2.667	.943
22	1. EASE OF EST & MAIN CON AIRSPEED	.00	1.00	2.00	2.00	2.00	3.00	2.00	2.000	.577
23	2. PLANE TRIM SYS OVER SPEED RANGE	.00	.00	3.00	3.00	2.00	4.00	1.00	2.600	1.020
24	3. PITCH SENSITIVITY	.00	1.00	1.00	2.00	2.00	2.00	2.00	1.667	.471
25	4. STICK FORCE GRADIENT	.00	1.00	4.00	2.00	2.00	4.00	1.00	2.333	1.247
26	5. STICK FIXED STABILITY	.00	1.00	3.00	2.00	2.00	.00	2.00	2.000	.632
27	6. STICK FREE STABILITY	.00	2.00	3.00	2.00	2.00	2.00	.00	2.200	.400
28	7. RETURN TO TRIM	.00	.00	2.00	1.00	1.00	3.00	2.00	1.800	.748
29	8. MANEUVERING [illegible]	.00	2.00	3.00	2.00	2.00	2.00	1.00	2.000	.577
30	9. PHUGOID CHARACTERISTICS	.00	.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
31	10. DIVE RECOVERY	.00	2.00	2.00	2.00	.00	2.00	2.00	2.000	.000
70	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...)	.0 .0	1.4 .5	2.4 .8	2.0 .4	2.0 .5	2.7 .8	1.7 .5	2.1	.73

TASK	PILOT	COMMENTS
22	3	VERY EASY WITHIN TRIM RANGE. STICK FORCES ARE ON HEAVY SIDE.
[illegible]	[illegible]	POWERFUL AND POSITIVE
[illegible]	[illegible]	RAN OUT OF TRIM AROUND 74IAS
[illegible]	[illegible]	MAX TRIM SPEED 76IAS
[illegible]	[illegible]	NO TRIM BEYOND 70
[illegible]	[illegible]	GOOD
[illegible]	[illegible]	HIGH, BUT GOOD FOR TRAINER
[illegible]	[illegible]	EXCESSIVE
[illegible]	[illegible]	POSITIVE
[illegible]	[illegible]	FOR AIRSPEED TOO POWERFUL
[illegible]	[illegible]	HIGH, BUT GOOD FOR TRAINER
[illegible]	[illegible]	QUITE STABLE
[illegible]	[illegible]	APPEARS TO BE POSITIVE
[illegible]	[illegible]	POSITIVE
[illegible]	[illegible]	EXCESSIVE, HEAVY FORCES ARE REQUIRED TO CHANGE AIRSPEED
[illegible]	[illegible]	POSITIVE
[illegible]	[illegible]	POSITIVE
[illegible]	[illegible]	QUALITATIVELY GOOD
[illegible]	[illegible]	GOOD FREE RETURN
[illegible]	[illegible]	+-2-3 KTS
[illegible]	[illegible]	TOO STRONG A TENDENCY
[illegible]	[illegible]	VTRIM 52IAS LOW 50 HIGH 54, VTRIM 65IAS LOW 58 HIGH 79
[illegible]	[illegible]	GOOD-POSITIVE
[illegible]	[illegible]	SOMEWHAT SLOW
[illegible]	[illegible]	POSITIVE STICK FORCE/[illegible]
[illegible]	[illegible]	LIGHTLY DAMPED
[illegible]	[illegible]	UNSTABLE PHUGOID AT 60KTS
[illegible]	[illegible]	NEUTRAL
[illegible]	[illegible]	VTRIM 52IAS 22SEC PERIOD, VTRIM 65IAS 26 SEC PERIOD
[illegible]	[illegible]	GOOD-A LITTLE LIGHT FOR TRAINER
[illegible]	[illegible]	NO UNDESIRABLE CHARACTERISTICS WERE NOTED
[illegible]	[illegible]	SHORT PERIOD HEAVILY DAMPED
[illegible]	[illegible]	STICK GRADIENTS ARE LITTLE TOO HEAVY. SOME BUFFETING WELL INTO
[illegible]	[illegible]	CRUISING SPEED RANGE. RAN OUT OF TRIM AROUND 76KTS. SOFTNESS IN
[illegible]	[illegible]	SUDDEN ATTITUDE CHANGES.
70	7	EXCELLENT CONTROL CHARACTERISTICS FOR TRAINING MISSION

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	1.00	1.00	1.00	.00	.00	.00	.00	1.000	.000
33	1. AILERON FORCE GRADIENT	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.429	.495
34	2. RUDDER FORCE GRADIENT	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.429	.495
35	3. ROLL RATE OVER SPEED RANGE	1.00	1.00	1.00	3.00	3.00	3.00	2.00	2.000	.926
36	4. SIDESLIP CHARACTERISTICS	1.00	1.00	2.00	2.00	3.00	3.00	2.00	2.000	.756
37	5. EASE OF TURN ENTRY	1.00	1.00	1.00	1.00	2.00	2.00	1.00	1.286	.452
38	6. YAW DUE TO AILERON	2.00	1.00	2.00	2.00	.00	2.00	3.00	2.000	.577
39	7. YAW DUE TO ROLL	2.00	3.00	.00	1.00	2.00	.00	2.00	2.000	.632
40	8. EASE OF MAIN. 0.785RAD BANK TURN	1.00	1.00	1.00	1.00	2.00	1.00	3.00	1.429	.728
41	9. EASE OF MAIN. 1.047RAD BANK TURN	2.00	1.00	1.00	1.00	2.00	1.00	3.00	1.571	.728

TASK	DESCRIPTION	1		2		3		4		5		6		7		AVER.	STD DEV
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...)	1.3	.5	1.2	.6	1.4	.5	1.7	.7	2.2	.4	1.9	.8	2.0	.8	1.7	.72

TASK	PILOT	COMMENTS
33	3	VERY PLEASANT
[illegible]	[illegible]	CONTROL HARMONY VERY GOOD
[illegible]	[illegible]	OCCASIONALLY TOO LIGHT
[illegible]	[illegible]	EXCELLENT
[illegible]	[illegible]	ABOUT .209 TO .262 RAD./SEC AT SPEEDS CHECKED
[illegible]	[illegible]	.[illegible]RAD/SEC AT 32 IAS. .663RAD/SEC AT 57IAS
[illegible]	[illegible]	RUDDER FORCE REVERSED BUT GOOD OTHERWISE
[illegible]	[illegible]	ABOUT .2[illegible]RAD BANK REQD FOR MAX RUDDER DEFLECTION FOR CONSTANT HEADI
[illegible]	[illegible]	POSITIVE STABILITY HOWEVER A/S BLANKS OUT WITH YAW
[illegible]	[illegible]	RUDDER LOCKS
[illegible]	[illegible]	STEADY HEADING SIDESLIP--RUDDER FORCE GRADIENT LIGHTENS AFTERR ABOUT
[illegible]	[illegible]	1/2 THROW, BUT NO REVERSAL. FULL RUDDER REQUIRES .262RAD BANK-SLIGHT
[illegible]	[illegible]	PITCH UP--LIGHTLY POSITIVE DIHEDRAL EFFECT
[illegible]	[illegible]	VERY EASY
[illegible]	[illegible]	VERY LITTLE RUDDER REQUIRED FOR INITIAL ROLL, SLIGHTLY MORE FOR LATER
[illegible]	[illegible]	VERY NOTICEABLE. BUT STILL IT IS POSSIBLE TO MAKE A GOOD TURN WITH
[illegible]	[illegible]	AILERONS ONLY
[illegible]	[illegible]	VERY EASY TO MAINTAIN COORDINATED CONTROL
[illegible]	[illegible]	ABOUT .262RAD RUDDER FIXED
[illegible]	[illegible]	CAN PICK UP LOW WING WITH RUDDER--.262RAD ROLL IN 5 SEC WITH FULL
[illegible]	[illegible]	RUDDER AT 32IAS
[illegible]	[illegible]	ONE OF THE BEST
[illegible]	[illegible]	GOOD--SLIGHT AMOUNT OF TOP STICK REQUIRED
[illegible]	[illegible]	EXCELLENT
[illegible]	[illegible]	SAME AS D.8
[illegible]	[illegible]	VERY LIGHT AND RESPONSIVE
[illegible]	[illegible]	SUPERB COORDINATION IN MANEUVERING FLIGHT
[illegible]	[illegible]	EXCELLENT FOR THERMALING
[illegible]	[illegible]	SPIRAL STABILITY NEUTRAL--VERY GOOD--PITCH ROLL CONTROL AND RESPONSE
79	7	HARMONY IS VERY GOOD

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******** ZEROS INDICATE NO RATING BY PILOT ********

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	2.00	2.00	3.00	.00	.00	3.00	4.00	2.800	.748
33	1. AILERON FORCE GRADIENT	1.00	2.00	3.00	3.00	2.00	2.00	2.00	2.143	.639
34	2. RUDDER FORCE GRADIENT	1.00	3.00	1.00	1.00	3.00	3.00	3.00	1.857	.833
35	3. ROLL RATE OVER SPEED RANGE	2.00	2.00	2.00	2.00	2.00	2.00	3.00	2.143	.350
36	4. SIDESLIP CHARACTERISTICS	3.00	.00	3.00	3.00	3.00	3.00	4.00	2.833	.687
37	5. EASE OF TURN ENTRY	2.00	2.00	3.00	3.00	3.00	2.00	4.00	2.714	.700
38	6. YAW DUE TO AILERON	3.00	3.00	2.00	.00	3.00	3.00	4.00	2.667	.745
39	7. YAW DUE TO ROLL	3.00	3.00	.00	4.00	4.00	.00	3.00	3.400	.490
40	8. EASE OF MAIN. 0.785RAD BANK TURN	1.00	2.00	2.00	2.00	3.00	1.00	2.00	1.857	.639
41	9. EASE OF MAIN. 1.047RAD BANK TURN	2.00	2.00	2.00	2.00	3.00	1.00	3.00	2.143	.834
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.9 .7	2.1 .3	2.1 .6	2.5 .9	2.8 .6	2.1 .8	3.0 .8	2.4	.80

TASK	PILOT	COMMENTS
33	3	EXCESSIVE FRICTION
33	4	CONTROL HARMONY NOT GOOD--FOR LONG PERIODS OF TURNING FLT. IT
33	4	BECAME OBVIOUS THAT AILERON FORCES ARE TOO HEAVY.
33	5	JUST ABOUT RIGHT FOR PURE ROLL
34	3	VERY PLEASANT
35	1	RUDDER NOT EFFECTIVE ENOUGH AT LOW SPEEDS WHEN EXECUTING RAPIDLYLY
35	2	APPROX 3.5 SEC AT THERMALLING SPEEDS
35	5	ABOUT .349RAD/SEC AVERAGE
35	7	VTRIM 78IAS .489RAD/SEC, VTRIM 52IAS .384RAD/SEC
36	2	NOT CHECKED
36	3	AT SPEED GOES WILD=NO PROBLEM. RUDDER FORCE REVERSES
36	4	VERY LITTLE BANK REQUIRED FOR MAXIMUM RUDDER DEFLECTION FOR CONSTANT
36	4	HEADING FLT.
36	5	RUDDER OVERBALANCES BUT NO PROBLEM.
36	7	VTRIM 48 DFLAP=1, SPIRAL STABILITY SLIGHTLY NEGATIVE. MODERATE
36	7	PITCHUP-UNUSUAL! RUDDER OVER BALANCE ABOUT 1/2 DEFLECTION
37	2	RUDDER INSUFFICIENT BUT EVEN SO, THE TURN ENTRY WAS GOOD
37	3	NOT TOO EASY
37	5	HAVE TO WORK AT RUDDER TO COORDINATE
38	3	AVERAGE ADVERSE YAW
39	4	VERY DIFFICULT TO KEEP YAW STRING CENTERED
39	5	RUDDER KEEP WORKING TO CENTER OF YAW STRING
40	1	CAN BE FLOWN HANDS OFF
40	3	FAIRLY DIFFICULT AT LOWER SPEEDS
40	4	NO ELEVATOR FORCE
40	7	WORK TO COORDINATE
41	1	TENDS TO WING WALK
41	3	FAIRLY DIFFICULT AT LOWER SPEEDS
41	4	NO ELEVATOR FORCE
41	7	WORK TO COORDINATE
79	1	3 WEAK AT LOW SPEED(1*SEC 43-52IAS)GOOD AT HIGH SPEED(4SEC AT 70-97)
79	1	4,5,7 WOULD BE BETTER WITH MORE EFFECTIVE RUDDER
79	3	LATERAL-DIRECTIONAL HANDLING IS FAIRLY POOR. DIFFICULT TO MAINTAIN
79	3	TURN COORDINATION. AT LOWER SPEEDS THERE MUST BE SOME SEPARATION
79	3	ON THE ELEVATOR. RESULTING NIBBLE FEEDS BACK TO PILOT VIA
79	3	PITCH STICK. ROLLING OSCILLATION IS ALSO ENCOUNTERED DURING LOW
79	3	SPEED SPIRALING. LEARNING CURVE FOR TURN COORDINATION IS FAIRLY
79	3	GRADUAL ON SAILPLANE 2. RUDDER DEFLECTION IS ACCOMPANIED BY CHANGED
79	3	CHARACTERISTICS.
79	4	SIDESLIP-LATERAL POSITIVE, HOWEVER, EXPERIENCED RUDDER LOCK BOTH
79	4	DIRECTIONS. ALSO LOSE A/S WITH ABOUT 1/2 RUDDER DEFLECTION.
79	6	GIVES GOOD CONFIDENCE FOR SMALL THERMAL TURNS.
79	7	NOT ENOUGH RUDDER TO COORDINATE INITIAL MODERATE RATE TURN ENTRY.
79	7	STRONG PITCHUP WITH SIDESLIP VERY UNDESIRABLE

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	1.50	2.00	2.50	.00	.00	2.00	3.00	2.200	.510
33	1. AILERON FORCE GRADIENT	1.00	3.00	3.00	1.00	2.00	2.00	2.00	1.857	.639
34	2. RUDDER FORCE GRADIENT	1.00	2.00	2.00	1.00	3.00	3.00	4.00	2.286	1.030
35	3. ROLL RATE OVER SPEED RANGE	1.00	3.00	2.00	1.00	2.00	2.00	3.00	1.857	.639
36	4. SIDESLIP CHARACTERISTICS	2.00	3.00	2.00	3.00	4.00	3.00	3.00	2.857	.639
37	5. EASE OF TURN ENTRY	1.00	2.00	2.00	1.00	3.00	2.00	2.00	1.857	.639
38	6. YAW DUE TO AILERON	2.00	1.00	2.00	.00	3.00	2.00	3.00	2.167	.687
39	7. YAW DUE TO ROLL	1.00	3.00	.00	2.00	2.00	.00	3.00	2.200	.748
40	8. EASE OF MAIN. 0.785RAD BANK TURN	1.00	2.00	1.50	1.00	3.00	1.00	2.00	1.643	.693
41	9. EASE OF MAIN. 1.047RAD BANK TURN	2.00	2.00	1.50	1.00	3.00	1.00	3.00	1.929	.776
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.3 .5	2.1 .6	2.0 .4	1.4 .7	2.8 .6	2.0 .7	2.8 .6	2.1	.81

TASK	PILOT	COMMENTS
32	2	FLEXIBLE WING ON SAILPLANE 5 MAKES IT WORSE
33	3	LIGHT, MAYBE TOO MUCH SO.
33	4	AILERON-ELEVATOR FORCE HARMONY-EXCELLENT
34	3	PLEASANT
34	5	TOOK ATTENTION EFFORT TO COORDINATE
34	7	OVERBALANCES AT 3/4 DEFLECTION
35	3	NO VARIATION OBSERVED, ADEQUATE THROUGHOUT.
35	5	ABOUT .349RAD/SEC AT SPEEDS CHECKED
35	7	VTRIM 48KTS .384RAD/SEC, 80KTS .524RAD/SEC
36	2	RUDDER WEAK. PITCHES NOSE DOWN MODERATELY
36	3	PLEASANT, ALTHOUGH FORCE REVERSAL OCCURS. RUDDER RETURNS TO NEUTRAL
36	3	WHEN WINGS ARE LEVELED.
36	4	POSITIVE AT 60 IAS, FULL RUDDER DEFLECTION WILL RESULT IN RUDDER
36	4	LOCK! ALSO A LOSS OF AIRSPEED.
36	5	RUDDER FORCE LIGHTENED BUT NEVER ZERO OR REVERSED.
36	7	BUFFET/OVERBALANCE IN RUDDER IN BOTH DIRECTIONS,PITCH DOWN WITH SPLIP
37	3	LESS RUDDER REQUIRED THAN SAILPLANE 2
38	3	AVERAGE ADVERSE YAW
38	5	TAKES ATTENTION TO RUDDER
39	5	SEEMS PRONOUNCED. HAVE TO MODULATE RUDDER TO COORDINATE.
40	3	NO PROBLEM
40	5	RUDDER
41	3	NO PROBLEM
41	5	RUDDER AND STICK, SMALL GRADIENT
79	2	0 STICK FORCE/LGC PLEASANT IN TURNS. ABOVE 2G TURNS WILL SELF
79	2	TIGHTEN. TAIL BUFFET WITH AIR BRAKE OPEN SIDESLIPS ARE NOT
79	2	OBJECTIONABLE.
79	3	PLEASANT LATERAL HANDLING, BUT FALLS SHORT OF SAILPLANE 1 OR 5.
79	7	ROLLCOORDINATION NO PROBLEM-AILERONS VERYEFFECTIVE BELOW STALL SPD(30

******* ZEROS INDICATE NO RATING BY PILOT *******   SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLI'G	.00	2.00	2.00	.00	2.00	2.00	3.00	2.200	.400
33	1. AILERON FORCE GRADIENT	.00	2.00	2.00	2.00	2.00	2.00	3.00	2.167	.373
34	2. RUDDER FORCE GRADIENT	.00	2.00	2.00	2.00	2.00	2.00	3.00	2.167	.373
35	3. ROLL RATE OVER SPEED RANGE	.00	2.00	2.50	3.00	2.00	3.00	3.00	2.583	.449
36	4. SIDESLIP CHARACTERISTICS	.00	2.00	2.00	1.00	4.00	2.00	2.00	2.167	.898
37	5. EASE OF TURN ENTRY	.00	2.00	2.00	1.00	2.00	2.00	3.00	2.000	.577
38	6. YAW DUE TO AILERON	.00	1.00	2.00	.00	3.00	3.00	3.00	2.400	.800
39	7. YAW DUE TO ROLL	.00	2.00	.00	1.00	3.00	.00	3.00	2.250	.829
40	8. EASE OF MAIN. 0.785RAD BANK TURN	.00	2.00	2.00	1.00	1.00	2.00	4.00	2.000	1.000
41	9. EASE OF MAIN. 1.047RAD BANK TURN	.00	2.00	2.00	1.00	1.00	2.00	4.00	2.000	1.000

79 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)   .0 .0 1.9 .3 2.1 .2 1.5 .7 2.2 .9 2.2 .4 3.1 .6 2.2 .76

TASK	PILOT	COMMENTS
33	3	PLEASANT
34	3	PLEASANT
35	2	ABOUT 3.5 SEC
35	2	SLOWER WITH FLAPS DOWN
35	4	ROLL RATE IS ADEQUATE BUT NOT AS GOOD AS THE OTHER HIGH PERFORMANCE
35	4	SAILPLANES
35	5	ABOUT .349RAD/SEC
35	6	4 SEC AT 0 FLAP 52IAS, 5SEC AT .209RAD FLAP AT 39IAS.
35	7	VTRIM 48IAS .105RAD FLAP .384RAD/SEC.
36	5	SEEMED TO (TUCK) IN PITCH IN RIGHT FWD SLIP
36	6	PITCH DOWN
38	6	SUFFICIENT RUDDER TO BALANCE AILERON CONTROL
79	2	WING ROCKS AT BUFFET ONSET. GOOD
79	3	BECAUSE OF STICK BACK PRESSURE WORKING AGAINST CENTERING SPRING
79	3	IN LAT-DIR MANEUVERS. SOMEE LATERAL MANEUVERS ARE MIDLY OBJECTIONABLE
79	7	STRONGLY POSITIVE DIHEDRAL EFFECT. CONSIDERABLE TOP AILERON
79	7	REQD IN TURNS.

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******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	2.00	3.00	2.00	.00	.00	4.00	2.00	2.600	.800
33	1. AILERON FORCE GRADIENT	2.00	2.00	2.00	.00	.00	2.00	3.00	2.200	.400
34	2. RUDDER FORCE GRADIENT	2.00	2.00	3.00	.00	.00	3.00	3.00	2.600	.490
35	3. ROLL RATE OVER SPEED RANGE	2.00	3.00	2.50	.00	.00	5.00	4.00	3.300	1.077
36	4. SIDESLIP CHARACTERISTICS	2.00	4.00	3.00	.00	.00	3.00	2.00	2.800	.748
37	5. EASE OF TURN ENTRY	2.00	3.00	1.00	.00	.00	4.00	3.00	2.600	1.020
38	6. YAW DUE TO AILERON	2.00	2.00	2.00	.00	.00	6.00	3.00	3.000	1.549
39	7. YAW DUE TO ROLL	2.00	2.00	.00	.00	.00	.00	2.00	2.000	.000
40	8. EASE OF MAIN. 0.785RAD BANK TURN	1.00	1.00	1.00	.00	.00	2.00	1.00	1.200	.400
41	9. EASE OF MAIN. 1.047RAD BANK TURN	2.00	1.00	1.00	.00	.00	2.00	2.00	1.600	.490
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.9 .3	2.2 .9	1.9 .8	.0 .0	.0 .0	3.4 1.4	2.6 .8	2.4	1.06

TASK	PILOT	COMMENTS
33	3	PLEASANT, FAIRLY LARGE TOP AILERON REQUIRED.
34	3	LITTLE TOO HIGH OUTSIDE THE DEADBAND.
34	6	TOO HEAVY (NOT ENOUGH MECHANICAL ADVANTAGE)
35	2	5SEC AT 50KTS .105RAD FLAP, 4 SEC AT 60KTS 0 FLAP
35	3	SLOW BUT SURPRISINGLY GOOD.
35	7	LOW VTRIM 60KT FLAP 0 .262RAD/SEC
36	2	HEAVY, STABLE AILERON FORCES AND DISPLACEMENTS IN SIDESLIP. RUDDER
36	2	LOCKS-ABOUT 178N PEDAL FORCE REQD TO UNLOCK AT 70KTS. VERY LARGE
36	2	SIDESLIP ANGLES POSSIBLE, CONTROL OK.
36	7	RUDDER OVERBALANCE AT 3/4 DEFLECTION
37	2	LARGE AILERON AND RUDDER INPUTS REQD.
38	3	RUDDER SUFFICIENT TO BALANCE
38	3	ABOUT THE SAME AS SAILPLANE 3
39	2	CAN BE BALANCED WITH RUDDER AT THERMALLING SPEEDS.
40	3	EXCELLENT
41	3	EXCELLENT
79	1	IF SIZE AND SPAN OF SHIP WERE TAKEN INTO CONSIDERATION THE 2 RATINGS
79	1	WOULD BE BETTER
79	2	SURPRISINGLY GOOD LATERALLY FOR ITS SIZE.
79	3	IN SIDESLIP WITH FULL RUDDER, GLIDER FLIES ALMOST SIDEWAYS. PEDAL
79	3	FORCE REVERSES DIRECTION. STILL GOOD CONTROL IS MAINTAINED AND LESS
79	3	BUFFETING IS EXPERIENCED THAN IN MOST OTHER SHIPS. FAIRLY WIDE
79	3	DEADBAND ON ACTION OF RUDDER PEDAL OBSERVED. SUDDEN REMOVAL OF
79	3	RUDDER DEFLECTION EXCITED A WELL-DAMPED OSCILLATION OF THE FUSELAGE
79	3	WHEN FLYING IN SMOOTH AIR.
79	7	VERY STABLE IN TURN, VERY LITTLE TOP AILERON REQUIRED

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
32	D. PILOT OPINION OF LATERAL HANDLING	.00	.00	2.00	.00	.00	2.00	2.00	2.000	.000
33	1. AILERON FORCE GRADIENT	.00	2.00	2.00	2.00	2.00	2.00	2.00	2.000	.000
34	2. RUDDER FORCE GRADIENT	.00	2.00	2.00	2.00	3.00	2.00	2.00	2.167	.373
35	3. ROLL RATE OVER SPEED RANGE	.00	2.00	2.00	2.00	2.00	4.00	3.00	2.500	.764
36	4. SIDESLIP CHARACTERISTICS	.00	3.00	3.00	2.00	.00	3.00	2.00	2.600	.490
37	5. EASE OF TURN ENTRY	.00	3.00	1.00	2.00	.00	2.00	3.00	2.200	.748
38	6. YAW DUE TO AILERON	.00	3.00	2.00	.00	.00	3.00	2.00	2.500	.500
39	7. YAW DUE TO ROLL	.00	.00	.00	3.00	3.00	.00	1.00	2.333	.943
40	8. EASE OF MAIN. 0.785RAD BANK TURN	.00	2.00	1.00	3.00	2.50	5.00	2.00	2.583	1.239
41	9. EASE OF MAIN. 1.047RAD BANK TURN	.00	2.00	2.00	3.00	3.00	5.00	2.00	2.833	1.067
79	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	2.4 .5	1.9 .6	2.4 .5	2.6 .4	3.2 1.2	2.1 .6	2.4	.81

TASK	PILOT	COMMENTS
33	3	FEELS BETTER THAN PITCH STICK GRADIENT
34	3	GOOD
34	5	TOO HEAVY
35	3	GOOD
35	5	HIGH RUDDER FORCE TO COORDINATE
35	7	VTRIM 52IAS .314RAD/SEC, VTRIM 78IAS .454RAD/SEC
36	2	SLIGHT PITCH/ROLL COUPLING-ALSO RUDDER A LITTLE WEAK
36	3	LOWER SINK RATE THAN OTHERS
36	4	10DEG BANK WITH FULL RUDDER FOR CONSTANT HEADING SLIP--NO RUDDER
36	4	LOCK. LOSE AIRSPEED AFTER APPROX. .349RAD YAW
36	7	SLIGHT PITCH DOWN WITH SIDESLIP, .175RAD BANK FOR FULL RUDDER, SLIGHT
36	7	DIHEDRAL EFFECT AT 52IAS, NEUTRAL AT 78IAS
37	2	A LITTLE SLOW NEAR STALL.
37	3	VERY GOOD
38	3	ABOUT AVERAGE
40	2	VERY GOOD
40	4	BECAUSE OF HEAVY RUDDER FORCES, APPROX 89N IN MAINTAINING TURN
40	5	NEUTRAL LOW AMPLITUDE, LONG PERIOD
40	7	STICK FORCE/G APPROX 9N
41	2	VERY GOOD
41	5	BUFFETING
41	4	SAME AS .785RAD BANK
41	7	STICK FORCE/G APPROX 22N
79	2	EXCELLENT EXCEPT NEAR STALL
79	3	EXCELLENT LATERAL-DIRECTIONAL CHARACTERISTICS MIXED SOMEWHAT BY
79	3	BUFFETING. GOOD ROLL RESPONSE.
79	5	HARD TO COORDINATE RUDDER DUE TO UNHARMONIOUS FORCE (ONLY ABOUT 89N
79	5	BUT SEEMS HIGH RELATIVE TO STICK)
79	6	45 AND 60DEG- BANK LESS THAN EASY TO CONTROL, BUT STICK FORCE/G
79	6	VERY LIGHT RESULTING IN OVERCONTROLLING ELEVATOR AND GETTING STALL
79	6	BUFFETING FREQUENTLY.
79	7	VERY GOOD- RUDDER COORDINATION REQD WOULD NOT BE ACCEPTABLE IN A
79	7	POWERED AIRPLANE, BUT AS SAILPLANES GO....

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	PILOT 2	PILOT 3	PILOT 4	PILOT 5	PILOT 6	PILOT 7	AVER.	STD DEV
42	E. PILOT OPIN OF PLANE STALLSPIN CHAR	1.50	3.00	1.00	.00	.00	2.00	.00	1.875	.740
43	1. RUDDER,AILERON EFFECT DUR. STALL	2.00	3.00	2.00	1.00	2.00	2.00	2.00	2.000	.535
44	2. STALL WARNING	2.00	2.00	2.00	3.00	2.00	3.00	3.00	2.429	.495
45	3. AGGRAVATED STALL-TEND TO SPIN	1.00	4.00	2.00	2.00	.00	2.00	1.00	2.000	1.000
46	4. STICK FORCE GRADIENT	1.00	1.00	1.00	1.00	2.00	3.00	2.00	1.571	.728
47	5. STALL RECOVERY, ALTITUDE LOSS	1.00	1.00	1.00	1.00	2.00	2.00	.00	1.333	.471
48	6. SPIN ENTRY	.00	3.00	1.00	.00	.00	2.00	1.00	1.750	.829
49	7. SPIN RECOVERY	.00	1.00	1.00	.00	.00	.00	.00	1.000	.000
50	8. STALL FROM TURN AT LOW SPEED	1.00	2.00	1.00	1.00	2.00	2.00	.00	1.500	.500
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.3 .5	2.1 1.1	1.4 .5	1.5 .8	2.0 .0	2.3 .5	1.8 .7	1.8	.76

TASK	PILOT	COMMENTS
43	2	RUDDER EFFECTIVE, AILERONS INEFFECTIVE. RUDDER WILL NOT PICK UP
43	2	BUT WILL ARREST FURTHER DROP
44	3	ADEQUATE
44	4	BUFFET OCCURRED APPROX 1/2 KT ABOVE STALL
45	3	THERE IS A DEFINITE TENDENCY TO FALL OFF TO ONE SIDE
45	4	VERY SLOW WING DROP OFF, BUT EASILY RECOVERABLE BY RELEASING STICK
46	3	EXCELLENT
47	2	12M
47	3	VERY LITTLE
47	4	PRESSURE LESS THAN 15M.
48	2	MODERATE ENTRY RATE
48	3	SLOW BUT PLENTY OF TIME TO CATCH IT
49	2	IMMEDIATE RECOVERY
49	3	SLIGHTLY NEUTRAL ELEVATOR, SLIGHTLY OPPOSITE RUDDER
50	2	NO AGGREVATED STALL-SPIN ENTRY
50	3	DIFFICULT TO DO
80	3	STALL-SPIN CHARACTERISTICS ARE GOOD TO EXCELLENT. LACK OF SLIPPERI-
80	3	NESS (ASSOCIATED WITH GLASS SHIPS) IS PROBALLY RESPONSIBLE FOR GOOD
80	3	STALL CHARACTERISTICS
80	6	ALL THE ABOVE GAVE GREAT CONFIDENCE IN SHIP TO WORK WEAK LIFT AT
80	6	LOW ALTITUDE SAFELY
80	7	LIGHT BUFFET AT 35IAS, STALL AT 32IAS(1[G]). TURNING STALL, CROSSED
80	7	CONTROLS, AIRPLANE PRACTICALLTY RECOVERS BY ITSELF! NOSE FALLS THRU
80	7	AND AIRPLANE STARTS FLYING AGAIN. EXCELLENT CHARACTERISTICS-VERY SAFE

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
42	E. PILOT OPIN OF PLANE STALLSPIN CHAR	1.00	1.00	3.00	.00	.00	5.00	1.00	2.200	1.600
43	1. RUDDER,AILERON EFFECT DUR. STALL	1.00	1.00	3.00	1.00	2.00	4.00	1.00	1.857	1.125
44	2. STALL WARNING	1.00	1.00	3.00	3.00	2.00	5.00	4.00	2.714	1.385
45	3. AGGRAVATED STALL-TEND TO SPIN	1.00	1.00	2.00	1.00	3.00	6.00	1.00	2.143	1.726
46	4. STICK FORCE GRADIENT	1.00	1.00	2.00	2.00	3.00	3.00	2.00	2.000	.756
47	5. STALL RECOVERY, ALTITUDE LOSS	1.00	.00	2.00	1.00	2.00	3.00	1.00	1.667	.745
48	6. SPIN ENTRY	.00	.00	2.00	.00	.00	5.00	2.00	3.000	1.414
49	7. SPIN RECOVERY	.00	.00	2.00	.00	.00	.00	1.00	1.500	.500
50	8. STALL FROM TURN AT LOW SPEED	1.00	1.00	2.00	1.00	3.00	4.00	1.00	1.857	1.125
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.0 .0	1.0 .0	2.2 .4	1.5 .8	2.5 .5	4.3 1.0	1.6 1.0	2.1	1.27

TASK	PILOT	COMMENTS
43	3	DURING STALLS RUDDER POOR, AILERON FAIRLY GOOD
44	3	ADEQUATE, SOME OF IT IS IN THE FORM OF CHANGING NOISE CHARACTER.
44	7	NO BUFFET WARNING-DIRECTIONAL STABILITY APPARENTLY DETERIATES!
45	7	WANDERS IN YAW
45	3	NONE FOUND
46	3	ABOUT AVERAGE
47	2	15M.
48	3	INCIPIENT SPIN FAIRLY MILD
49	3	EASY RECOVERY
49	7	JUST RELAX AFT STICK FORCE
50	2	NO PROBLEM
80	5	PRIOR TO STALL THERE IS A TENDENCY OF ROLL OSCILLATIONS.
80	3	EASY STALL RECOVERY FROM EITHER TURN DIRECTION.
80	6	VERY SLIGHT PRE-STALL WARNING AND SUDDEN BREAK MAKE SHIP UNDESIRABLE
80	6	FOR EXTENSIVE THERMAL SOARING FOR A LOW TIME PILOT
80	7	VERY DOCILE STALLS, TURNING AND 1 LG(STICK CAN BE HELD FULL AFT
80	7	AND AIRPLANE CAN BE REVERSED IN BANK--CAN BE FLOWN INDEFINITELY
80	7	IF HELD

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
42	E. PILOT OPIN OF PLANE STALLSPIN CHAR	2.00	2.00	3.00	.00	.00	4.00	1.00	2.400	1.020
43	1. RUDDER,AILERON EFFECT DUR. STALL	1.00	2.00	2.00	2.00	2.00	3.00	1.00	1.857	.639
44	2. STALL WARNING	1.00	2.00	3.00	2.00	2.00	3.00	4.00	2.429	.904
45	3. AGGRAVATED STALL-TEND TO SPIN	2.00	3.00	3.00	3.00	3.00	4.00	1.00	2.571	.904
46	4. STICK FORCE GRADIENT	3.00	2.00	3.00	2.00	2.00	4.00	2.00	2.571	.728
47	5. STALL RECOVERY, ALTITUDE LOSS	2.00	2.00	2.00	3.00	2.00	3.00	1.00	2.143	.639
48	6. SPIN ENTRY	.00	.00	3.00	.00	.00	3.00	1.00	2.333	.943
49	7. SPIN RECOVERY	.00	.00	3.00	.00	.00	.00	1.00	2.000	1.000
50	8. STALL FROM TURN AT LOW SPEED	2.00	1.00	2.00	.00	2.00	2.00	1.00	1.667	.471

60 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 1.8 .7 1.8 .4 2.6 .5 2.4 .5 2.2 .4 3.1 .6 1.5 1.0 2.2 .83

TASK	PILOT	COMMENTS
44	2	3 KTS
44	3	ADEQUATE
44	4	VERY LIGHT AIRFRAME BUFFET APPROX. 2KTS ABOVE STALL.
44	5	LIGHT BUFFETING CLOSE (3KTS) TO STALL
44	7	NO WARNING
45	3	IT IS PRESENT IN THE GLIDER
45	4	WITH FULLY DEVELOPED STALL, A/C ROLLS OFF ON LEFT WING AND NOSE
45	4	DROPS APPROX. .534RAD BELOW HORIZON
45	5	FALLS OFF ON WING AND ROTATES, EASY TO CONTROL
46	1	COULD BE IMPROVED--NOT ENOUGH FORCE
46	2	GOOD
46	3	NOT REALLY GOOD CUE FOR IMMINENT STALL
46	4	VERY LIGHT
47	2	15 METERS
47	3	LITTLE LOSS IN ALTITUDE
47	4	ALTITUDE LESS THAN 30M.
47	7	15M /C&K STALL AT 42KTS
48	2	NONE QUITE RESISTANT
48	3	FAIRLY ABRUPT FALL-OFF TO ONE SIDE
49	2	NONE
49	3	SLOWER THAN OTHERS
50	2	VERY DOCILE
50	6	UNABLE TO STALL DUE TO LACK OF UP CONTROL TRAVEL.
60	3	AILERON REMAINS EFFECTIVE THROUGHOUT STALL. FALLS OFF TO ONE SIDE
60	3	FAIRLY QUICKLY. DOES NOT RESPOND TO CORRECTIVE ACTION AS READILY
60	3	AS SAILPLANE 2
60	7	STALL CHARACTERISTICS EXCELLENT-AILERONS EFFECTIVE THROUGHOUT STALL-
60	7	CAN HOLD STICK FULL AFT AND USE RUDDER AND AILERONS FOR CONTROL
60	7	FOR SOME TIME.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
42	E. PILOT OPIN OF PLANE STALLSPIN CHAR	.00	3.00	2.00	.00	3.00	3.00	4.00	3.000	.632
43	1. RUDDER,AILERON EFFECT DUR. STALL	.00	2.00	2.00	2.00	2.00	2.00	4.00	2.333	.745
44	2. STALL WARNING	.00	2.00	2.00	2.00	2.00	3.00	4.00	2.500	.764
45	3. AGGRAVATED STALL-TEND TO SPIN	.00	3.00	3.00	2.00	3.00	3.00	4.00	3.000	.577
46	4. STICK FORCE GRADIENT	.00	1.00	2.00	1.00	2.00	4.00	2.00	2.000	1.000
47	5. STALL RECOVERY, ALTITUDE LOSS	.00	1.00	2.00	1.00	.00	2.00	3.00	1.800	.748
48	6. SPIN ENTRY	.00	3.00	.00	.00	.00	2.00	3.00	2.667	.471
49	7. SPIN RECOVERY	.00	1.00	.00	.00	.00	.00	2.00	1.500	.500
50	8. STALL FROM TURN AT LOW SPEED	.00	1.00	2.00	2.00	.00	.00	4.00	2.250	1.090

80 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) .0 .0 1.7 .8 2.2 .4 1.7 .5 2.2 .4 2.7 .7 3.2 .8 2.3 .89

TASK	PILOT	COMMENTS
43	3	GOOD
44	6	STALL WARNING OCCURS APPROX. 2 KTS ABOVE STALL.
44	7	NONE-LIGHT BUFFET AT STALL V STALL 30KTS FLAP 0
45	2	WILL DROP WING UNCONTROLLABLY IF AGGRAVATED, BUT NT ABRUPT WING DROP
45	4	LEFT WING DROPS AT THE STALL WITH FLAPS UP. OK WITH FLAPS.
45	5	SEEMED TO HAVE TENDENCY TO SPIN
45	7	DEFINITE FEELING OF BEGINNING AUTOROTATION
46	3	POSITIVE
46	4	VERY POSITIVE GRADIENT
47	2	12 METERS
47	5	NEGLIGIBLE ALT LOSS
47	6	LESS THAN 15M.
47	7	ABOUT 24M IN 1G STALL
49	2	IMMEDIATE WITH RELEASE OF BACK PRESSURE
50	6	UNABLE TO DO DUE TO LIMITED STICK TRAVEL.
50	7	ALT LOSS ABOUT 61 METERS.
80	3	GOOD
80	5	NO OBJECTIONABLE CHARACTERISTICS
80	7	WING DROP FOLLOWING ABUSED STALL IS UNCONTROLLABLE AND IS FOLLOWED
80	7	BY AUTOROTATIVE TENDENCY.

****** ZEROS INDICATE NO RATING BY PILOT *******

SATLPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
42	E. PILOT OPIN OF PLANE STALLSPIN CHAR	2.00	3.00	2.00	.00	.00	3.00	1.00	2.200	.748
43	1. RUDDER,AILERON EFFECT DUR. STALL	2.00	3.00	2.00	.00	.00	2.00	1.00	2.000	.632
44	2. STALL WARNING	1.00	2.00	2.00	.00	.00	2.00	4.00	2.200	.980
45	3. AGGRAVATED STALL-TENC TO SPIN	2.00	2.00	2.00	.00	.00	4.00	1.00	2.200	.980
46	4. STICK FORCE GRADIENT	2.00	3.00	2.00	.00	.00	3.00	3.00	2.600	.490
47	5. STALL RECOVERY, ALTITUDE LOSS	2.00	1.00	2.00	.00	.00	3.00	1.00	1.800	.748
48	6. SPIN ENTRY	.00	3.00	2.00	.00	.00	2.00	1.00	2.000	.707
49	7. SPIN RECOVERY	.00	3.00	2.00	.00	.00	.00	.00	2.500	.500
50	8. STALL FROM TURN AT LOW SPEED	1.00	4.00	2.00	.00	.00	2.00	1.00	2.000	1.095
80	AVER. AND STU. DEV. OF SUBTASKS(EX 1,2,..)	1.7 .5	2.6 .9	2.0 .0	.0 .0	.0 .0	2.6 .7	1.7 1.2	2.1	.85

TASK	PILOT	COMMENTS
43	2	OK UNTIL NEARLY FULL AFT STICK REACHED
44	2	BUFFET PROGRESSIVE WITH AFT STICK MOVEMENT
44	3	VERY POSITIVE
44	7	VSTALL 38KT LANDING FLAPS-VERY LIGHT BUFFET JUST BEFORE STALL
45	2	LARGE LONGITUDINAL STICK MOTIONS REQD NEAR STALL. AT STICK POSITION
45	2	WITHIN 5CM OF AFT STOP, SHIP WILL ENTER SPIN.
45	3	NONE
45	7	ABUSED STALL RESULTS IN EVENTUAL WING DROP BUT NO INCIPIENT SPIN
46	2	LIGHT
46	3	GOOD BUT NOT IN TURNS
47	2	12 METERS
47	3	SMALL
47	7	ABOUT 15M IF WING ALLOWED TO DROP
48	2	RELATIVELY RESISTANT
48	3	SLOW INCIPIENT SPIN QUICKLY STOPPED SINCE AILERON REMAINS EFFECTIVE
48	3	BEYOND THE STALL
49	2	OK WITH STICK RELEASED, NOT INSTANT RECOVERY, BUT FAIRLY PROMPT
49	3	NOT TRIED
50	2	CONSIDERABLE LOSS OF STICK FORCE GRADIENT UNDER CGC.
50	3	MILD
50	7	TENDS TO JUST PICK UP SPEED AND FLY OUT
80	3	NO TENDENCY TO FALL OFF TO EITHER SIDE AFTER STALL. STALL WARNING
80	3	IS IN THE FORM OF INCREASING TAIL SHAKE. OVERALL IMPRESSION OF
80	3	STALL AND INCIPIENT SPINI BETTER THAN MOST.
80	7	AILERONS HAVE LOW BUT POSITIVE EFFECTIVERESS THROUGH STALL--EXCELLENT
80	7	STALL CHARACTERISTICS

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
42	E. PILOT OPIN OF PLANE STALLSPIN CHAR	.00	.00	3.00	.00	.00	6.00	4.00	4.333	1.247
43	1. RUDDER,AILERON EFFECT DUR. STALL	.00	5.00	2.00	2.00	2.00	4.00	3.00	3.000	1.155
44	2. STALL WARNING	.00	1.00	2.00	4.00	2.00	4.00	1.00	2.333	1.247
45	3. AGGRAVATED STALL-TEND TO SPIN	.00	5.00	3.00	3.00	3.00	6.00	4.00	4.000	1.155
46	4. STICK FORCE GRADIENT	.00	1.00	2.00	2.00	2.00	5.00	2.00	2.333	1.247
47	5. STALL RECOVERY, ALTITUDE LOSS	.00	5.00	2.00	2.00	2.00	7.00	4.00	3.667	1.886
48	6. SPIN ENTRY	.00	5.00	3.00	.00	.00	6.00	4.00	4.500	1.118
49	7. SPIN RECOVERY	.00	.00	3.00	.00	.00	.00	1.00	2.000	1.000
50	8. STALL FROM TURN AT LOW SPEED	.00	5.00	2.00	2.00	2.00	9.00	4.00	4.000	2.517
80	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...)	.0 .0	3.9 1.8	2.4 .5	2.5 .8	2.2 .4	5.9 1.6	2.9 1.3	3.3	1.75

TASK	PILOT	COMMENTS
43	2	WEAK JUST ABOVE STALL-INEFFECTIVE AFTER STALL
44	2	GOOD
44	4	STALL WARNING CONSISTED OF AIRFRAME BUFFET THAT BECAME APPARENT
44	4	8-10KTS ABOVE STALL. IF THERMALLING IS CONDUCTED CONSTANTLY IN
44	4	STALL BUFFET THEN THE PILOT WILL IGNORE THE STALL BUFFET. NORMAL
44	4	STALL BUFFET SHOULD NOT OCCUR ABOVE THERMAL SPEED.
45	2	YES
45	4	A/C TENDS TO ROLL LEFT AND NOSE PITCHES DOWN AT THE STALL.
45	4	RECOVERY IS GOOD.
45	5	LEFT WING DROPS, TENDENCY TO SPIN
45	7	SAILPLANE WANTS TO GO [OVER THE TOP[FROM A RIGHT TURN AND DIG IN
45	7	FURTHER TO THE LEFT FROM A LEFT TURN (FEET ON THE FLOOR, CROSS-
45	7	CONTROLLED STALLS)
46	2	GOOD
47	2	NOT MEASURED BUT CONSIDERABLE
47	4	LESS THAN 61M.
47	5	LESS THAN 61M.
47	7	AGGRAVATATED STALL 61-91M.
48	2	MODERATE ENTRY RATE BUT POSITIVE ENTRY
48	3	FAIRLY QUICK
50	3	WELL
80	3	ADEQUATE STALL WARNING, ABRUPT NOSE SLICE FOLLOWS SOME LATERAL
80	3	OSCILLATIONS JUST PRIOR TO STALL.
80	6	STICK FORCES DO NOT TELL YOU THAT YOU ARE ABOUT TO ENCOUNTER THE
80	6	MORE THAN 1.5 [G[. IT DOES SEEM TO INCREASE NEAR THE STALL AT 2 [G[.
80	7	HAS A TENDENCY TO YAW, ROTATE AND [BURY[THE NOSE FROM A CROSS-
80	7	CONTROLLED, ABUSED STALL

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
51	F. PILOT OPIN. OF PLANE LANDING CHAR.	1.50	2.00	1.00	.00	.00	2.00	2.00	1.700	.600
52	1. PILOT VISIBILITY	2.00	1.00	3.00	3.00	2.00	4.00	3.00	2.571	.904
53	2. GLIDE SLOPE CONTROL	1.00	1.00	1.00	1.00	2.00	3.00	2.00	1.571	.728
54	3. AIRS. CONTROL/AIRB. EASE OF MOD.	2.00	4.00	1.00	1.00	2.00	3.00	2.00	2.143	.990
55	4. EASE OF LAND. AT INTENDED SPOT	1.00	2.00	1.00	1.00	2.00	2.00	2.00	1.571	.495
56	5. EASE OF CONTROL, SINK AT TOUCH.	1.00	2.00	1.00	1.00	.00	2.00	2.00	1.500	.500
57	6. CONTROL DURING ROLLOUT	1.00	1.00	1.00	1.00	2.00	3.00	1.00	1.429	.728

81 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 1.3 .5 1.8 1.1 1.3 .7 1.3 .7 2.0 .0 2.8 .7 2.0 .6 1.8 .86

TASK	PILOT	COMMENTS
52	4	VISIBILITY DOWN AND AFT RESTRICTED BY FUSELAGE AND WING
53	7	48KTS V-TRIM--SLIGHT NOSE UP TRIM CHANGE WITH SPOILER DEPLOYMENT.
53	7	MOMENTARY 4KT DECAY STICK-FREE. THEN INCREASE TO ABOUT 45KTS-VERY GD
54	2	AIRBRAKES SUCK OPEN
81	2	OUTSTANDING GROUND MANEUVERABILITY
81	3	VERY EASY TO LAND IT WELL
81	6	OVER THE NOSE VISIBILITY WEAK. SPOILERS COULD BE MORE POWERFUL.
81	6	TAIL SKID RESTRICTS GROUND STEERING.

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
51	F. PILOT OPIN. OF PLANE LANDING CHAR.	2.00	.00	2.00	.00	.00	5.00	2.00	2.750	1.299
52	1. PILOT VISIBILITY	1.00	1.00	2.00	1.00	1.00	3.00	1.00	1.429	.728
53	2. GLIDE SLOPE CONTROL	3.00	3.00	3.00	2.00	2.00	5.00	3.00	3.000	.926
54	3. AIRS. CONTROL/AIRB. EASE OF MOD.	3.00	2.00	3.00	4.00	2.00	5.00	3.00	3.143	.990
55	4. EASE OF LAND. AT INTENDED SPOT	3.00	3.00	2.00	3.00	2.00	4.00	2.00	2.571	.728
56	5. EASE OF CONTROL, SINK AT TOUCH.	1.00	2.00	2.00	3.00	2.00	4.00	2.00	2.286	.881
57	6. CONTROL DURING ROLLOUT	2.00	2.00	2.00	3.00	3.00	4.00	2.00	2.571	.728

81 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 2.2 .9 2.0 .6 2.3 .5 2.7 .9 2.0 .6 4.2 .7 2.2 .7 2.5 1.01

TASK	PILOT	COMMENTS
52	3	GOOD
53	3	AIRBRAKES A LITTLE WEAK
53	5	COULD USE MORE EFFECTIVE DIVE BRAKES
53	6	VERY LOW FORCE GRADIENT RESULTS IN OVERCONTROL.
53	5	CONSTANT ATTITUDE
54	4	CONTROL LOCK VERY POOR. UNLOCKING OF AIRBRAKES RESULTS IN
54	4	DEPLOYMENT TO 3/4 OPEN IF UNRESTRAINED. A VERY POSITIVE FORCE IS
54	4	REQUIRED TO CLOSE THE AIRBRAKES. I FEEL THAT YOU SHOULD BE ABLE
54	4	TO SELECT AIRBRAKE RAPIDLY AND IT WILL REMAIN AT SELECTED POSITION
54	4	WHEN THE CONTROL IS RELEASED.
54	5	HAVE TO HOLD AGAINST FURTHER EXTENSION WHICH I PREFER TO HOLDING WITH
55	3	GOOD
55	6	AIRBRAKES COULD BE MORE EFFECTIVE
55	5	LONGITUDINAL OR -DIRECT WIND EFFECT
56	3	VERY GOOD
56	6	VERY LOW FORCE GRADIENT AND SHORT CONTROL STICK RESULTED IN OVERCNTRL
57	3	BETTER THAN SAILPLANE 5
57	4	INSUFFICIENT RUDDER FOR ADEQUATE MANEUVERING.
57	5	DIRECTIONAL TAKES A LITTLE EFFORT
81	1	2,3,4 INADEQUATE DIVE BRAKE EFFECTIVENESS. 6. SOME CONCENTRATION
81	1	REQUIRED (LATERAL AND DIRECTIONAL)
81	3	LANDING CHARACTERISTICS ARE BETTER THAN AVERAGE. NO TENDENCY TO GO
81	3	TO EITHER SIDE.
81	6	DIVE BRAKES WEAK. USE OF DRAG CHUTE NOT INCLUDED IN TEST EVALUATION.
81	6	TOUCHDOWN CAN BE ACHIEVED BUT ONLY THRU USE OF EXCESSIVE SPEED.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
51	F. PILOT OPIN. OF PLANE LANDING CHAR.	3.00	3.00	3.00	.00	.00	4.00	3.00	3.200	[illegible]
52	1. PILOT VISIBILITY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
53	2. GLIDE SLOPE CONTROL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
54	3. AIRB. CONTROL-AIRB. EASE OF MOD.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
55	4. EASE OF LAND. AT INTENDED SPOT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
56	5. EASE OF CONTROL, SINK AT TOUCH.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
57	6. CONTROL DURING ROLLOUT	2.00	3.50	2.00	[illegible]	[illegible]	4.00	4.00	4.000	[illegible]

	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	PILOT 1		2		3		4		5		6		7		AVER.	STD DEV
61	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	2.7	.5	2.6	.8	2.5	1.0	2.5	1.[illegible]	3.4	2.7	2.8	.7	2.3	.9	2.7	1.33

TASK	PILOT	COMMENTS
52	3	EXCELLENT
[illegible]	[illegible]	AIR BRAKES A LITTLE WEAK
[illegible]	[illegible]	VERY LOW FORCE GRADIENT RESULTS IN SOME PORPOSING PRIOR TO FLARE.
[illegible]	[illegible]	LIGHT SUCK-OPEN FORCES
[illegible]	[illegible]	VERY GOOD CONTROL, BUT FAST
[illegible]	[illegible]	AIR BRAKE HAS A TENDENCY, AFTER BEING UNLOCKED TO FLOAT TO APPROX.
[illegible]	[illegible]	3/4 EXTENDED POSITION. I FEEL THE AIR BRAKE SHOULD HAVE THE
[illegible]	[illegible]	CAPABILITY OF RAPID MOVEMENT BUT THE AIR BRAKE SHOULD REMAIN IN
[illegible]	[illegible]	THE SELECTED POSITION.
[illegible]	[illegible]	SLIGHT PITCHDOWN WITH SPOILER EXTENSION AT 58 KTS.
[illegible]	[illegible]	NOT AS EASY AS SOME
[illegible]	[illegible]	AIR BRAKES COULD BE MORE EFFECTIVE
[illegible]	[illegible]	EASY TO CONTROL IN PITCH IN TURBULENCE
[illegible]	[illegible]	GOOD
[illegible]	[illegible]	VERY LOW FORCE GRADIENT RESULTS IN SOME VERTICAL OSCILLATION DURING
[illegible]	[illegible]	THE FLARE.
[illegible]	[illegible]	RUDDER FAIR--AILERONS FAIR
[illegible]	[illegible]	GOOD
[illegible]	[illegible]	BRAKE CONTROL AWKWARD TO APPLY WITHOUT TAKING HAND FROM CONTROL STICK
[illegible]	[illegible]	HOWEVER, FULL BRAKE APPLICATION RESULTED IN ONLY MINOR BRAKING ACTION
[illegible]	[illegible]	LOST CONTROL DURING ONE OF LANDINGS.
[illegible]	[illegible]	MINIMUM RUDDER AND TAILSKID FOR DIRECTIONAL CONTROL. A STEERABLE
[illegible]	[illegible]	TAIL WHEEL WOULD HELP.
61	[illegible]	2,3,4,5 COULD BE IMPROVED WITH MORE POWERFUL DIVE BRAKE
61	[illegible]	FAIR CROSSWIND CAPABILITY
61	[illegible]	FAIRLY EASY TO MAKE GOOD LANDING. TOUCHES DOWN AT HIGHER SPEEDS
61	[illegible]	THAN ONE WOULD LIKE TO.
61	7	LIMITED YAW CONTROL ON ROLLOUT.

******* ZEROS INDICATE NO RATING BY PILOT *******   SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
51	F. PILOT OPIN. OF PLANE LANDING CHAR.	.00	.00	3.00	.00	4.00	3.00	4.00	3.500	.500
52	1. PILOT VISIBILITY	.00	1.00	2.00	1.00	2.00	2.00	1.00	1.500	.500
53	2. GLIDE SLOPE CONTROL	.00	3.00	2.00	3.00	3.00	2.00	3.00	2.667	.471
54	3. AIRS. CONTROL-APPR. EASE OF MOD.	.00	4.00	5.00	4.00	4.50	4.00	5.00	4.083	.607
55	4. EASE OF LAND. AT INTENDED SPOT	.00	4.00	3.00	4.00	4.25	4.00	4.00	3.875	.508
56	5. EASE OF CONTROL. STAB AT TOUCH.	.00	2.00	2.00	2.00	4.25	2.00	3.00	2.583	.867
57	6. CONTROL DURING ROLLOUT	.00	1.00	2.00	1.00	2.00	2.00	2.00	1.667	.471

81 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...)   .0 .0 2.5 1.3 2.3 .5 2.5 1.3 3.3 1.1 2.7 .9 3.0 1.3 2.7   1.14

TASK	PILOT	COMMENTS
52	3	EXCELLENT
53	2	OK UNTIL FLARE THEN FLOATS IF SPEED IS TOO HIGH
53	3	EXCELLENT
53	4	SELECTION OF FLAPS FOR DRAG RESULTS IN LARGE PITCH ANGLES
54	4	HARD TO MODULATE FLAPS. HANDLE UNHANDY.
54	4	NOT TRIED AT LOW SPEEDS; IT WOULD BE OBJECTIONABLE
54	4	AIR BRAKE(FLAPS) REQUIRE CONSTANT FORCE AND EFFORT TO SELECT AND
54	4	MAINTAIN DESIRED POSITION. BECAUSE OF HANDLE LOCATION AND TRAVEL
54	4	DIFFICULT TO OBTAIN MAX. FLAP TRAVEL. FORCES VERY HIGH AT MAX.
54	4	FLAP SPEED.
56	3	FLOATED DURING FLARE
81	2	PRECISE SPEED CONTROL REQUIRED AT FLARE ENTRY POINT IF DROP-IN OR
81	2	LONG FLOAT ARE TO BE AVOIDED
81	3	INSUFFICIENT PRACTICE FOR OBJECTIVE EVALULATION OF THE FLAP SYSTEM
81	3	FEEL THAT IT IS OK IN MOST SITUATIONS
81	5	THE AIR BRAKE(FLAPS) IS VERY DIFFICULT TO MANIPULATE, I.E. TAKES
81	5	LARGE FORCE TO PUT IT WHERE I WANT TO MAINTAIN VEL. IN ADDITION,
81	5	THE AIRPLANE ATTITUDE CHANGES DRASTICALLY TO WHERE I AM UNCERTAIN
81	5	OF FLIGHT PATH.
81	6	CHANGE OF TRIM FROM FLAPS -> TO LANDING BRAKE CAUSES HIGH STICK
81	6	FORCES. FLAP CONTROL REQUIRES VERY HIGH FORCES TO DEPLOY AROUND
81	6	.524-.698RAD.
81	7	PHYSICALLY UNABLE TO SELECT 1.396RAD FLAPS IN FINAL STAGE OF APPROACH
81	7	HAVE TO HOLD HIGH FORCE ON FLAP HANDLE WITH LEFT HAND AND MAKE SMALL,
81	7	PRECISE STICK INPUTS WITH RIGHT HAND TO EXECUTE GLIDE PATH AND LDG.
81	7	ON THE FINAL LANDING, I MADE A HIGH BASE LEG AND SELECTED LANDING
81	7	FLAPS; THEN CONTROLLED FLIGHT PATH WITH PITCH ATTITUDE ONLY, ACCEPTING
81	7	SPEED, WHICH BLED OFF RAPIDLY DURING FLARE. I CONSIDER THIS AN
81	7	AWKWARD AND IMPRECISE METHOD. IT DOES NOT OFFER THE PRECISION IN
81	7	FLIGHT PATH CONTROL WHICH IS AVAILABLE WITH THE METHOD OF CONTROLLING
81	7	AIRSPEED WITH MODULATION OF A DRAG DEVICE THROUGHOUT THE APPROACH.

******** ZEROS INDICATE NO RATING BY PILOT ********

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
S1	F. PILOT OPIN. OF PLANE LANDING CHAR.	2.50	4.00	3.00	.00	.00	2.00	3.00	2.900	.663
S2	1. PILOT VISIBILITY	2.00	1.00	1.00	.00	.00	2.00	1.00	1.400	.490
S3	2. GLIDE SLOPE CONTROL	2.00	3.00	2.00	.00	.00	2.00	3.00	2.400	.490
S4	3. AIRS. CONTROL-AIRB. EASE OF MOD.	3.00	3.00	3.00	.00	.00	2.00	3.00	2.600	.490
S5	4. EASE OF LAND. AT INTENDED SPOT	2.00	2.00	3.00	.00	.00	3.00	3.00	2.600	.490
S6	5. EASE OF CONTROL. SINK AT TOUCH.	2.00	3.00	3.00	.00	.00	2.00	2.00	2.400	.490
S7	6. CONTROL DURING ROLLOUT	2.00	4.00	4.00	.00	.00	6.00	4.00	4.000	1.265
81	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...)	2.2 .4	2.7 .9	2.5 1.0	.0 .0	.0 .0	2.7 1.5	2.7 .9	2.6	1.02

TASK	PILOT	COMMENTS
S2	3	EXCELLENT
S3	2	COULD USE A LITTLE MORE AIR BRAKE
S3	3	EXCELLENT
S3	6	USE OF DRAG CHUTE NOT INCLUDED IN EVALUATION
S3	7	SLIGHT PITCH DOWN WITH SPEED BRAKE EXTENSION--GOOD
S4	7	GOOD EXCEPT SOME SUCK-OPEN FORCE ABOVE 65KTS.
S5	3	FAST BUT ROLLS FOR A LONG TIME.
S5	3	FLEXIBLE WING FOOLS PILOT. MUST FLY SMOOTHLY
S7	3	LATERAL CONTROL VERY SLOW UNLESS FLAPS RAISED DURING ROLLOUT. RUDDER
S7	3	FAIR. CROSSWIND CAPABILITY LIMITED. DON'T LIKE TO PUT UP FLAPS
S7	3	DURING ROLLOUT.
S7	7	SO SO
81	3	LATERAL CONTROL FORCES INCREASED--UNEVEN FORCE GRADIENT
81	3	LONG ROLLOUT. COULD USE MORE BRAKING ACTION. CONTINUOUS PILOT ACTION
81	3	NEED FOR STRAIGHT, WINGS LEVEL ROLLOUT.
81	6	CROSSWIND CAPABILITY SEVERELY LIMITED. PROBABLY 15KT. VECTOR MAX.
81	6	A STEERABLE TAILWHEEL WOULD HELP.
81	7	MARGINAL YAW CONTROL ON GROUND. FLAPS MUST BE RAISED AFTER TOUCHDOWN.
81	7	THIS LANDING WAS CONDUCTED WITH WIND ABOUT 5KTS STRAIGHT DOWN THE
81	7	RUNWAY. MY RATING WOULD LIKELY BE WORSE(HIGHER) IN A CROSSWIND.

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
S1	F. PILOT OPIN. OF PLANE LANDING CHAR.	.00	.00	2.00	.00	.00	2.00	3.00	2.333	.471
S2	1. PILOT VISIBILITY	.00	1.00	1.00	1.00	1.00	1.00	1.00	1.000	.000
S3	2. GLIDE SLOPE CONTROL	.00	1.00	3.00	1.00	1.00	1.00	1.00	1.333	.745
S4	3. AIRS. CONTROL-AIRB. EASE OF MOD.	.00	.00	2.00	1.00	1.00	1.00	3.00	1.600	.800
S5	4. EASE OF LAND. AT INTENDED SPOT	.00	2.00	1.00	1.00	1.00	2.00	2.00	1.500	.500
S6	5. EASE OF CONTROL. SINK AT TOUCH.	.00	3.00	2.00	1.00	.00	2.00	2.00	1.800	.400
S7	6. CONTROL DURING ROLLOUT	.00	2.00	1.00	1.00	1.00	2.00	1.00	1.333	.471
81	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...)	.0 .0	1.6 .5	1.7 .7	1.0 .0	1.0 .0	1.5 .5	1.7 .7	1.6	.60

TASK	PILOT	COMMENTS
S2	3	EXCELLENT
S3	3	GOOD-DUE TO DIVE BRAKE EFFECTIVENESS IT IS EASY TO MAKE DIFFICULT
S3	3	LANDING
S4	3	GOOD--POOR IF NOT GREASED WELL. VERY POOR
S4	5	EXCELLENT-BUT ONE HAS TO BE CAREFUL WITH BRAKES NEAR THE GROUND
S5	7	SLIGHT PITCH DOWN WITH SPOILER EXTENSION(GOOD CHARACTERISTIC)
S6	2	VERY GOOD EXCEPT AS NOTED
S7	3	VERY GOOD
81	3	AIR BRAKES SUCK OPEN--MODERATE FORCE TO CLOSE. TENDENCY TO LAND
81	3	HARD IF MORE THAN ABOUT 1/4 AIR BRAKE USED.
81	4	SHIP HAS VERY GOOD LANDING CHARACTERISTICS. LARGE SINK RATES REQUIRE
81	4	DEFINITE PILOT ATTENTION
81	7	VERY GOOD EXCEPT AIRPLANE IS NOT FORGIVING OF LETTING AIRSPEED
81	7	DECAY BELOW 17IAS ON FINAL APPROACH

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION	1.00	1.00	1.00	.00	.00	1.00	.00	1.000	.000
59	A. PILOT OPINION OF TOW	1.00	1.00	1.00	.00	3.00	2.00	1.00	1.500	.764
60	1. EASE OF MAINTAINING POSITION	1.00	1.00	1.00	.00	3.00	1.00	1.00	1.333	.745
61	2. RESPONSE TO VERTICAL CURRENTS	1.00	2.00	1.00	.00	3.00	2.00	2.00	1.833	.687
62	3. RELEASE	1.00	.00	2.00	.00	2.00	2.00	2.00	1.800	.400
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.0 .0	1.5 .5	1.3 .5	.0 .0	2.7 .5	1.7 .5	1.7 .5	1.6	.68

TASK	PILOT	COMMENTS
60	5	PITCH PRIMARILY--LAT/DIR-2
82	3	NO DIFFICULTY WAS EXPERIENCED DUE TO PRESENCE OF VERTICAL CURRENTS
82	7	HAD TO USE SLIGHT FORWARD STICK FORCE DURING TOW--TRIM NOT ADEQUATE
82	7	FORCE WAS VERY LOW HOWEVER

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION	1.50	2.00	3.00	.00	3.50	2.00	3.00	2.500	.707
59	A. PILOT OPINION OF TOW	1.50	2.00	2.00	.00	3.00	2.00	4.00	2.417	.837
60	1. EASE OF MAINTAINING POSITION	1.00	2.00	3.00	.00	3.00	2.00	4.00	2.500	.957
61	2. RESPONSE TO VERTICAL CURRENTS	2.00	3.00	3.00	.00	2.00	2.00	3.00	2.500	.500
62	3. RELEASE	1.00	.00	2.00	.00	.00	2.00	2.00	1.750	.433
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.3 .5	2.5 .5	2.7 .5	.0 .0	2.5 .5	2.0 .0	3.0 .8	2.3	.77

TASK	PILOT	COMMENTS
60	5	GOT TO STAY WITH IT. DIRECTIONAL MOST OBVIOUS
61	5	GOT SOME TOW ROPE REBOUNDING
82	1	I BELIEVE THAT THE BOUNCY RIDE IN TURBULENCE IS CAUSED BY WING FLEX
82	3	I WOULD RATE THE SAILPLANE ABOUT THE SAME HERE AS IN SMOOTH AIR.

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION	2.00	3.00	2.00	.00	.00	3.00	3.00	2.600	.490
59	A. PILOT OPINION OF TOW	1.50	3.00	2.00	.00	3.00	2.00	3.00	2.417	.607
60	1. EASE OF MAINTAINING POSITION	2.00	3.00	2.00	.00	3.00	2.00	3.00	2.500	.500
61	2. RESPONSE TO VERTICAL CURRENTS	3.00	4.00	2.00	.00	3.00	2.00	3.00	2.833	.687
62	3. RELEASE	1.00	.00	3.00	.00	2.00	2.00	2.00	2.000	.632
82	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	2.0 .8	3.5 .5	2.3 .5	.0 .0	2.7 .5	2.0 .0	2.7 .5	2.5	.70

TASK	PILOT	COMMENTS
59	3	MODERATE CONTROL ACTIVITY REQD.
60	3	NO PROBLEMS
60	6	SOME TENDENCY OF NOSE TO PORPOISE.
61	1	TENDENCY TO PITCH WHEN ENCOUNTERING TURBULENCE
61	3	NO PROBLEMS
82	3	NOISY
82	2	SOME STICK INSTABILITY IN TURBULENCE
82	7	HIGH WORKLOAD IN RUDDERS AND AILERONS

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION	.00	2.00	2.50	.00	.00	3.00	3.00	2.625	.415
59	A. PILOT OPINION OF TOW	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
60	1. EASE OF MAINTAINING POSITION	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
61	2. RESPONSE TO VERTICAL CURRENTS	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
62	3. RELEASE	.00	.00	3.00	.00	.00	2.00	2.00	2.333	.471
62	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	2.0 .0	2.3 .5	.0 .0	.0 .0	2.0 .0	2.0 .0	2.1	.29

TASK	PILOT	COMMENTS
60	3	NO PROBLEM AT ALL
62	3	NOISY
62	2	GOOD
62	3	NO SIGNIFICANT DIFFERENCE FROM STILL AIR

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION	2.00	5.00	2.00	.00	.00	4.00	3.00	3.200	1.166
59	A. PILOT OPINION OF TOW	1.50	5.00	.00	.00	.00	4.00	5.00	3.875	1.431
60	1. EASE OF MAINTAINING POSITION	2.00	2.00	.00	.00	.00	3.00	5.00	3.000	1.225
61	2. RESPONSE TO VERTICAL CURRENTS	2.00	2.00	.00	.00	.00	3.00	3.00	2.500	.500
62	3. RELEASE	1.00	.00	.00	.00	.00	3.00	2.00	2.000	.816
62	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.7 .5	2.0 .0	.0 .0	.0 .0	.0 .0	3.0 .0	3.3 1.2	2.5	.99

TASK	PILOT	COMMENTS
59	2	OK AT 70KTS, AT 80KTS WORSE THAN IN SMOOTH AIR. MUST FLY WITH STICK
59	2	RIGID.
62	2	CANNOT FLY PITCH BY PRESSURE, MUST FLY BY POSITION.
62	3	NO ROUGH AIR TOW MADE
62	6	YAW AND ROLL RATES MAKE STAYING BEHIND TOWPLANE DIFFICULT IN ROUGH
62	6	THERMALS
62	7	LATERAL POSITIONING IS AN EASY TASK! PITCH IS DIFFICULT DUE TO
62	7	OVERCONTROL TENDENCY

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
58	III. FLIGHT CHARACTERISTICS IN CONVECTION	.00	3.00	2.00	.00	.00	5.00	2.00	3.000	1.225
59	A. PILOT OPINION OF TOW	.00	2.00	2.00	.00	.00	3.00	2.00	2.250	.433
60	1. EASE OF MAINTAINING POSITION	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
61	2. RESPONSE TO VERTICAL CURRENTS	.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
62	3. RELEASE	.00	.00	2.00	.00	.00	2.00	2.00	2.000	.000
62	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	2.0 .0	2.0 .0	.0 .0	.0 .0	2.0 .0	2.0 .0	2.0	.00

TASK	PILOT	COMMENTS
61	3	NOT EXCESSIVE
62	3	SAME AS SMOOTH AIR
62	3	AIRSPEED BLEEDS OFF QUICKLY DURING PULLUP, REQUIRING PILOT ATTENTION
62	7	HIGHER WORKLOAD THAN IN SMOOTH AIR, OF COURSE, BUT NO UNUSUAL
62	7	CHARACTERISTICS DUE TO TURBULENCE

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	1.00	1.00	1.00	.00	.00	1.00	1.00	1.000	.000
64	1. LOWSPEED HANDLING	1.00	1.00	1.00	.00	2.00	1.00	1.00	1.167	.373
65	2. STALL-SPIN SUSCEPTIBILITY	2.00	2.00	1.50	.00	2.00	1.00	2.00	1.750	.382
66	3. EASE OF CENTERING THERMAL	1.00	1.00	2.00	.00	3.00	2.00	2.00	1.833	.687
67	4. SPEED CONTROL	1.00	1.00	2.00	.00	2.00	1.00	2.00	1.500	.500

63 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 1.3 .4 1.3 .4 1.6 .4 .0 .0 2.2 .4 1.3 .4 1.7 .4 1.6 .56

TASK	PILOT	COMMENTS
83	2	BEST THERMAL MANEUVERING OF ANY SAILPLANE-PERHAPS DUE TO POWERFUL
83	2	RUDDER
83	3	GOOD AILERON -- ROLL RESPONSE IN THERMALS, EASY TO MUSCLE GLIDER
83	3	AROUND IN THERMALS
83	7	LAT-DIR QUALITIES EXCELLENT-VERY LOW WORKLOAD-LITTLE RUDDER REQ
83	7	FOR TRIM COORDINATION-EXCELLENT CONTROL HARMONY, BOTH IN FORCES
83	7	AND RESPONES

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	1.50	1.50	3.00	.00	.00	2.00	4.00	2.400	.970
64	1. LOWSPEED HANDLING	2.00	2.00	2.00	.00	4.00	3.00	4.00	2.833	.898
65	2. STALL-SPIN SUSCEPTIBILITY	1.00	1.00	2.00	.00	3.00	5.00	2.00	2.333	1.374
66	3. EASE OF CENTERING THERMAL	2.00	1.00	3.00	.00	3.00	2.00	3.00	2.333	.745
67	4. SPEED CONTROL	1.00	1.00	4.00	.00	3.00	1.00	3.00	2.167	1.213

63 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 1.5 .5 1.3 .4 2.7 .8 .0 .0 3.2 .4 2.7 1.5 3.0 .7 2.4 1.11

TASK	PILOT	COMMENTS
64	3	HAS SOME UNDESIRABLE CHARACTERISTICS, BUFFETING.
64	5	(FEELS) PRECARIOUS DUE TO STICK POSITION AFT WITH LOW FORCE AND YAW
64	5	STRING OSCILLATION
65	3	AVERAGE
66	3	MORE DIFFICULT THAN OTHERS
67	3	FAIRLY DIFFICULT
83	1	1,3 RUDDER EFFECTIVENESS COULD BE IMPROVED. 4, WILL SPIRAL HANDS
83	1	OFF FOR LONG PERIODS
83	3	LACK OF DIRECTIONAL STABILITY AND DIFFICULT TURN COORDINATION
83	3	LOW RUDDER EFFECTIVENESS
83	7	HIGH WORKLOAD DUE TO RUDDER AND AILERON ACTIVITY TO KEEP SIDESLIP
83	7	NEAR ZERO-GIVES IMPRESSION OF LOW DIRECTIONAL STABILITY.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	2.00	2.00	2.00	.00	.00	2.00	2.00	2.000	.000
64	1. LOWSPEED HANDLING	1.00	2.00	3.00	.00	2.00	2.00	2.00	2.000	.577
65	2. STALL-SPIN SUSCEPTIBILITY	2.00	2.00	2.00	.00	2.00	3.00	1.00	2.000	.577
66	3. EASE OF CENTERING THERMAL	1.00	2.00	2.00	.00	2.00	2.00	3.00	2.000	.577
67	4. SPEED CONTROL	2.00	2.00	3.00	.00	2.00	2.00	3.00	2.333	.471

83 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) 1.5 .5 2.0 .0 2.5 .5 .0 .0 2.0 .0 2.2 .4 2.2 .4 2.1 .57

TASK	PILOT	COMMENTS
64	3	PLEASANT, ALTHOUGH STICK FORCES ON THE LIGHT SIDE
65	3	NO STALL-SPIN TENDENCY OBSERVED WHILE THERMALLING
66	3	COMFORTABLE
67	1	TENDENCY TO PITCH IN TURBULENT THERMALS
67	3	BETTER THAN SAILPLANE 2
83	2	WILL OCCASIONALLY SELF-TIGHTEN DURING STRONG UP-GUSTS. CAN TIGHTEN
83	2	ITSELF INTO STALL IN STRONG GUST
83	5	ONE FEELS IMMEDIATELY AT HOME IN THE SHIP
83	7	GOOD CONTROL HARMONY AT 50KTS BUT POOR AT HIGHER SPEEDS. RUDDER
83	7	COORDINATION AND AIRSPEED CONTROL CREATE FAIRLY HIGH WORKLOAD.

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	.00	2.00	2.50	.00	.00	3.00	4.00	2.875	.740
64	1. LOWSPEED HANDLING	.00	2.00	2.00	.00	.00	3.00	4.00	2.750	.829
65	2. STALL-SPIN SUSCEPTIBILITY	.00	3.00	3.50	.00	.00	2.00	3.00	2.875	.415
66	3. EASE OF CENTERING THERMAL	.00	3.00	3.00	.00	.00	2.00	3.00	2.750	.433
67	4. SPEED CONTROL	.00	2.00	3.00	.00	.00	5.00	3.00	3.250	1.090

83 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..) .0 .0 2.0 .0 2.6 .4 .0 .0 .0 .0 3.2 1.1 3.2 .4 2.8 .81

TASK	PILOT	COMMENTS
64	3	GOOD
65	3	NO UNDESIRABLE CHARACTERISTICS NOTED
66	3	TENDED TO OVERCONTROL WITH RUDDER
67	3	NOT AS GOOD AS SAILPLANE 1
83	2	I DON'T FIND TRIMMER OBJECTIONABLE. WING-ROCK IS BOTHERSOME
83	2	WHENEVER BUFFET ENCOUNTERED IN GUSTY THERMALS
83	5	QUITE GOOD IN CIRCLING FLIGHT, THOUGH NOT AS GOOD AS SAILPLANE 1
83	6	GUSTS CAUSE NOSE TO CHANGE ATTITUDE UP AND DOWN. THIS TENDENCY
83	6	MUST BE FOUGHT BY PILOT TO MAINTAIN THERMAL LOCATION.
83	7	EXCESSIVE TOP AILERON REQUIRED.

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1		2		3		4		5		6		7		AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	2.50		3.00		1.00		.00		.00		3.00		2.00		2.300	.748
64	1: LOWSPEED HANDLING	2.00		3.00		2.00		.00		.00		3.00		2.00		2.400	.490
65	2: STALL-SPIN SUSCEPTIBILITY	1.00		2.00		2.00		.00		.00		2.00		1.00		1.600	.490
66	3: EASE OF CENTERING THERMAL	3.00		3.00		.00		.00		.00		4.00		1.00		2.750	1.090
67	4. SPEED CONTROL	2.00		2.00		1.00		.00		.00		2.00		4.00		2.200	.980
83	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	2.0	.7	2.5	.5	1.7	.5	.0	.0	.0	.0	2.7	.8	2.0	1.2	2.2	.89

TASK	PILOT	COMMENTS
64	3	EXCELLENT
65	3	MILDLY SUSCEPTIBLE
66	3	NOT TRIED
67	2	LOW STICK FORCE/[G(RATHER NICE FOR THERMALLING.
67	3	BETTER THAN SMALLER SPAN GLIDERS
83	3	STICK CANNOT BE RELEASED FOR MORE THAN A FEW SECONDS
83	3	IN STEEPLY BANKED CIRCLING FLIGHT, FAIRLY LARGE LONG. STICK INPUTS
83	3	COULD BE MADE WITHOUT ANY CHANGE IN SPEED OR [G(FORCES.
83	3	(ELASTIC EFFECT?)
83	6	ROLL RATE AND YAW DUE TO AILERON MAKE THERMAL CENTERING DIFFICULT
83	6	IN SMALL ROUGH THERMALS.
83	7	VERY STABLE IN BANK ANGLE BUT ATTENTION REQUIRED TO CONTROL AIRSPEED.

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1		2		3		4		5		6		7		AVER.	STD DEV
63	B. PILOT OPINION OF CIRCLING FLIGHT	.00		.00		2.00		.00		.00		8.00		3.00		4.333	2.625
64	1: LOWSPEED HANDLING	.00		4.00		.00		.00		.00		8.00		3.00		5.000	2.160
65	2: STALL-SPIN SUSCEPTIBILITY	.00		5.00		.00		.00		.00		9.00		2.00		5.333	2.867
66	3: EASE OF CENTERING THERMAL	.00		3.00		.00		.00		.00		4.00		3.00		3.333	.471
67	4. SPEED CONTROL	.00		4.00		.00		.00		.00		6.00		3.00		4.333	1.247
83	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0	.0	4.0	.7	.0	.0	.0	.0	.0	.0	6.7	1.9	2.7	.4	4.5	2.06

TASK	PILOT	COMMENTS
64	2	GOOD EXCEPT NEAR STALL
64	3	GOOD, BUFFETING IS ANNOYING
65	3	MODERATE
65	3	BREAKS OFF INTO INCIPIENT SPIN EASILY
66	3	YES
66	3	GOOD
67	2	EXCESSIVE PITCH FORCE CHANGE WITH BANK CHANGE
67	3	EXCELLENT, BUT ON HEAVY SIDE
83	7	HIGH WORKLOAD! TURBULENCE CAUSES UPSETS IN ALL THREE AXES.
83	7	REQUIRING LOTS OF STICK AND RUDDER MOVEMENT

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 1 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	1.00	1.00	1.00	.00	.00	4.00	1.00	1.600	1.200
69	1. EASE OF CONTROLLING AIRSPEED	1.00	1.00	1.00	.00	2.00	4.00	1.00	1.667	1.106
70	2. PULL UP INTO THERMAL	1.00	1.00	2.00	.00	2.00	2.00	2.00	1.667	.471
71	3. EASE OF PERF. SECONDARY TASKS	1.00	1.00	1.00	.00	2.00	2.00	2.00	1.500	.500
72	4. RIDE QUALITY	1.00	2.00	4.00	.00	2.00	2.00	2.00	2.167	.898
73	5. EASE OF MAIN. STRAIGHT FLIGHT	1.00	2.00	1.00	.00	.00	2.00	1.00	1.400	.490
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.0 .0	1.4 .5	1.8 1.2	.0 .0	2.0 .0	2.4 .8	1.6 .5	1.7	.79

TASK	PILOT	COMMENTS
69	5	BELOW 61IAS+-3 ABOVE 61IAS DUE TO TRIM
69	6	UNABLE TO TRIM TO HIGH SPEEDS, I.C. ABOVE 61KTS.
70	3	SPEED BLEEDS OFF QUICKLY, HAVE TO WATCH IT.
71	3	EXCELLENT
72	3	GOOD, BUT SMALL, UNCOMFORTABLE COCKPIT DEGRADES IT
73	3	EXCELLENT
84	3	LARGE ATTITUDE CHANGES WITH AIRSPEED
84	7	VERY LOW WORKLOAD. OVERALL, THE BEST FLYING OF ALL SAILPLANES
84	7	THEY SHOULD ALL FLY THIS WAY(
85	7	

SAILPLANE 2 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	1.00	2.00	2.00	.00	.00	2.00	4.00	2.200	.980
69	1. EASE OF CONTROLLING AIRSPEED	1.00	2.00	2.00	.00	3.00	2.00	3.00	2.167	.687
70	2. PULL UP INTO THERMAL	1.00	1.00	1.00	.00	3.00	2.00	4.00	2.000	1.155
71	3. EASE OF PERF. SECONDARY TASKS	1.00	1.00	3.00	.00	3.00	3.00	4.00	2.500	1.118
72	4. RIDE QUALITY	2.00	2.00	2.00	.00	2.00	2.00	3.00	2.167	.373
73	5. EASE OF MAIN. STRAIGHT FLIGHT	1.00	1.00	2.00	.00	3.00	4.00	3.00	2.333	1.106
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.2 .4	1.4 .5	2.0 .6	.0 .0	2.8 .4	2.6 .8	3.4 .5	2.2	.96

TASK	PILOT	COMMENTS
70	3	VERY PLEASANT
71	3	DIFFICULT
72	3	GOOD
73	3	NO PROBLEM
73	5	DIRECTIONALLY LOOSE
73	6	NOSE WANDERS, BUT NOT SO AS TO DETRACT FROM MISSION
84	1	BOUNCY BECAUSE OF WING FLEXING.
84	3	VERY EASY TO CHANGE SPEEDS. NEGATIVE FLAPS RESULT IN QUICK AIRSPEED
84	3	CHANGES(QUICKER THAN SAILPLANE 5) WITH NO ATTITUDE OR SOUND CHANGES.
84	3	THIS FEATURE MAY MAKE SHIP DIFFICULT FOR TRANSITIONING.
85	3	

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 3 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	1.50	3.00	1.50	.00	.00	4.00	3.00	2.600	.970
69	1. EASE OF CONTROLLING AIRSPEED	2.00	3.00	1.00	.00	3.00	4.00	2.00	2.333	.943
70	2. PULL UP INTO THERMAL	1.00	3.00	1.00	.00	3.00	2.00	2.00	2.000	.816
71	3. EASE OF PERF. SECONDARY TASKS	2.00	4.00	2.00	.00	4.00	3.00	3.00	3.000	.816
72	4. RIDE QUALITY	2.00	3.00	1.50	.00	2.00	2.00	3.00	2.250	.559
73	5. EASE OF MAIN. STRAIGHT FLIGHT	1.00	1.00	1.00	.00	2.00	2.00	2.00	1.500	.500

84 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...) 1.6 .5 2.6 1.0 1.3 .4 .0 .0 2.8 .7 2.6 .8 2.4 .5 2.2 .89

TASK	PILOT	COMMENTS
69	3	EASY TASK
69	6	UNABLE TO TRIM TO INTERTHERMAL SPEEDS, I.E. ABOVE 80 KTS.
70	3	FEELS PLEASANT
70	3	OK
70	5	NO HANDS OFF, OVERCONTROLS
71	2	MUST HOLD STICK AT ALL TIMES
71	3	PLEASANT TO FLY
71	5	ANY DISTURBANCE IN PITCH REQUIRES IMMEDIATE ATTENTION
84	1	1,3,4 TENDENCY TO PITCH IN TURBULENT AIR-CAN'T RELEASE STICK
84	1	WITHOUT DIVERGENCE WHETHER CIRCLING OR STRT AND LEVEL FLIGHT.
84	3	FAIRLY LARGE ATTITUDE CHANGES WITH AIRSPEED CHANGE. SAILPLANE 2 IS
84	3	BETTER IN THIS PHASE OF FLIGHT.
84	7	GENERALLY GOOD! POOR CONTROL HARMONY AT HIGHER SPEEDS(SENSITIVE
84	7	PITCH, SLUGGISH AILERONS).
85	7	

SAILPLANE 4 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	.00	2.00	3.50	.00	.00	2.00	2.00	2.375	.650
69	1. EASE OF CONTROLLING AIRSPEED	.00	2.00	3.50	.00	.00	2.00	2.00	2.375	.650
70	2. PULL UP INTO THERMAL	.00	2.00	3.50	.00	.00	4.00	2.00	2.875	.893
71	3. EASE OF PERF. SECONDARY TASKS	.00	2.00	3.00	.00	.00	3.00	2.00	2.500	.500
72	4. RIDE QUALITY	.00	2.00	3.00	.00	.00	3.00	3.00	2.750	.433
73	5. EASE OF MAIN. STRAIGHT FLIGHT	.00	1.00	2.00	.00	.00	2.00	2.00	1.750	.433

84 AVER. AND STD. DEV. OF SUBTASKS(EX 1,2...) .0 .0 1.8 .4 3.0 .5 .0 .0 .0 .0 2.8 .7 2.2 .4 2.4 .72

TASK	PILOT	COMMENTS
69	3	WORKING AGAINST SPRING IS ANNOYING
70	3	WORKING AGAINST SPRING IS ANNOYING
71	3	OCCASIONAL LACK OF COORDINATION NOTED WHILE WATCHING OTHER GLIDERS
72	3	NOISIER THAN MOST
73	3	GOOD
84	3	MAINLY CONCERNED WITH WORKING AGAINST THE FEEL SPRING
84	6	PULLUP TENDS TO PITCH UP TOO HIGH. ROLL AT TOP OK, BUT IF YOU
84	6	OVERSHOOT, UNBANKING MAY BE DIFFICULT DUE TO LACK OF TOP AILERON
84	6	AT SPEEDS BELOW 40 KTS WITH FLAPS AT .314RAD.
84	7	HOLDS HEADING AND SPEED WELL! SECONDARY TASKS CAN BE ATTENDED TO.
85	7	

******* ZEROS INDICATE NO RATING BY PILOT *******

SAILPLANE 5 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	1.00	3.00	1.00	.00	.00	3.00	3.00	2.200	.980
69	1. EASE OF CONTROLLING AIRSPEED	1.00	3.00	3.00	.00	.00	5.00	3.00	2.600	1.356
70	2. PULL UP INTO THERMAL	2.00	3.00	1.00	.00	.00	2.00	2.00	2.000	.632
71	3. EASE OF PERF. SECONDARY TASKS	1.00	6.00	1.00	.00	.00	4.00	4.00	3.200	1.939
72	4. RIDE QUALITY	1.00	2.00	1.00	.00	.00	2.00	3.00	1.800	.748
73	5. EASE OF MAIN. STRAIGHT FLIGHT	1.00	1.00	1.00	.00	.00	3.00	2.00	1.600	.800
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	1.2 .4	2.8 1.7	1.2 .4	.0 .0	.0 .0	3.2 1.2	2.8 .7	2.2	1.34

TASK	PILOT	COMMENTS
69	6	AT HIGH CRUISING SPEEDS, UNABLE TO TRIM. POSITIVE C&C GIVES NOSE UP
69	6	INPUT TO STICK
70	3	SPECTACULAR DUE TO LARGER KINETIC ENERGY OF GLIDER
71	2	MUST HOLD STICK RIGID, NOT UNPLEASANT IF CONTROL TASK IS VERY
71	2	(OPEN LOOP).
71	3	OK
72	3	EXCELLENT
73	3	EXCELLENT
84	2	CAN'T LET GO OF STICK
84	3	IN TURBULENCE, IN THE APPROACH CONFIGURATION, FULL PILOT ATTENTION
84	3	IS REQUIRED. SLOWER ROLL RATE IS NOTICEABLE, LOT OF RUDDER ACTIVITY
84	3	WAS NEEDED IN THIS PHASE OF FLIGHT.
84	7	AT 85-90 KTS PENETRATION SPEED, QUIET EXCEPT FOR LIGHT RATTLE IN
84	7	WINGS; ATTENTION TO AIRSPEED(PITCH) CONTROL LEAVES LITTLE TIME FOR
84	7	SECONDARY TASKS; TURBULENCE CAUSES CONTINUAL SMALL PITCH UPSETS.
85	7	

SAILPLANE 6 DATA

TASK	DESCRIPTION OF TASKS	PILOT 1	2	3	4	5	6	7	AVER.	STD DEV
68	C. PILOT OPINION OF CRUISING FLIGHT	.00	.00	1.00	.00	.00	2.00	2.00	1.667	.471
69	1. EASE OF CONTROLLING AIRSPEED	.00	1.00	1.00	.00	.00	2.00	2.00	1.500	.500
70	2. PULL UP INTO THERMAL	.00	1.00	2.00	.00	.00	5.00	2.00	2.500	1.500
71	3. EASE OF PERF. SECONDARY TASKS	.00	1.00	1.00	.00	.00	2.00	2.00	1.500	.500
72	4. RIDE QUALITY	.00	2.00	3.00	.00	.00	3.00	2.00	2.500	.500
73	5. EASE OF MAIN. STRAIGHT FLIGHT	.00	1.00	2.00	.00	.00	2.00	2.00	1.750	.433
84	AVER. AND STD. DEV. OF SUBTASKS(EX 1,2,..)	.0 .0	1.2 .4	1.8 .7	.0 .0	.0 .0	2.8 1.2	2.0 .0	1.9	.92

TASK	PILOT	COMMENTS
69	3	EXCELLENT
70	3	SHOULD BE VERY MODERATE IN THIS GLIDER
70	6	AIRSPEED DECREASES VERY RAPIDLY
71	3	QUICK, EASY BECAUSE OF LARGE STABILITY
72	3	NOT AS SOFT AS GLASS SHIP, NOISY
73	3	GOOD
84	3	LARGE ATTITUDE CHANGES WITH AIRSPEED, NOISY AT TIMES
84	7	SAME GENERAL COMMENTS AS FOR CIRCLING FLIGHT

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15. Supplementary Notes

Langley technical monitor: Joseph Gera

Final report.

16. Abstract

Seven test pilots flew six sailplanes in a round-robin evaluation of sailplane handling qualities. An evaluation was made of the handling qualities over the sailplane operational envelope using the Cooper-Harper Rating Scale and pilot comments as the evaluation instrument. The sailplanes were chosen to represent the range of handling and performance characteristics of high performance sailplanes in current use.

The evaluation sailplanes were found generally deficient in the area of cockpit layout. The pilots indicated general dissatisfaction with high pitch sensitivity especially when coupled with inertially induced stick forces. While all sailplanes were judged satisfactory for centering thermals and in the ease of speed control in circling flight, pilot opinions diverged on the maneuvering response, pull-out characteristics from a dive, and on phugoid damping. Lateral-directional control problems were noted mainly during takeoff and landing for most sailplanes with the landing wheel ahead of center of gravity. Pilot opinion of in-flight lateral-directional stability and control was generally satisfactory. Five of the evaluation sailplanes exhibited a very narrow airspeed band in which perceptible stall warning buffet occurred. However, this characteristic was considered not objectionable when stall recovery was easy. The pilots objected to the characteristics of a wide airspeed band of stall warning followed by a stall with yawing and rolling tendency and substantial loss of altitude during the stall. Glide path control for the evaluation sailplanes was found to be generally objectionable.

17. Key Words (Suggested by Author(s)) Handling Qualities, Stability and Control, Sailplane, Cooper-Harper Rating Scale, Pilot Ratings, Sailplane Certification	18. Distribution Statement Unclassified-Unlimited Subject Category 08

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